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α. See alpha.

A. Abbreviation for absolute temperature.

Å. Abbreviation for Ångström.

a. Abbreviation for atto-, a prefix meaning 10^{-18} unit.

AAAS. See American Association for the Advancement of Science.

AATCC. See American Associates of Textile Chemists and Colorists.

abaca. (Manila hemp). The strongest vegetable fiber, obtained from the leaves of a tree of the banana family. The fibers are 4–8 ft long, light in weight, soft, lustrous, and nearly white; they do not swell or lose strength when wet. Denier ranges from 300 to 500. Combustible, but self-extinguishing.

Source: Philippines, Central America, Sumatra.

Use: Heavy cordage and twine, especially for marine use; manila paper.

See hemp.

abate. (O,O-dimethyl phosphorothioate-O,O-diester with 4,4'-thiodiphenol; temephos).
CAS: 3383-96-8. $[(\text{CH}_3\text{O})_2\text{PSOC}_6\text{H}_4]_2\text{S}$.

Properties: Colorless crystals. Mp 30C.

Hazard: Toxic by ingestion and inhalation. Cholinesterase inhibitor.

Use: Pesticide.

Abbé condenser. Substage two-lens condenser giving numerical aperture of 1:20–1:25. Three-lens versions give numerical aperture of 1:40.

Abbé number. (1)The reciprocal of dispersive power. (2) The measure of optical dispersion of a glass; the measure of two planes not displacing the axis.

Abegg's rule. The solubility of salts of alkali metals decreases in strong acids and increases in weak acids as atomic weight increases. This is an empirical rule; sodium chloride is an exception.

Abel-Pensky flash-point apparatus. Instrument used for the determination of the flash point of petroleum.

aberration. Deviation from the ideal in an optical system, the image points being imperfect or improperly located.

aberration, spherical. The aberration by which light passing through the edge of a lens with spherical surfaces comes to focus in a different image plane from that passing through the lens center.

abherent. Any substance that prevents adhesion of a material to itself or to another material. It may be in the form of a dry powder (a silicate such as talc, mica, or diatomaceous earth); a suspension (bentonite-water); a solution (soap-water); or a soft solid (stearic acid, tallow waxes). Abherents are used as dusting agents and mold washes in the adhesives, rubber, and plastics industries. Fats and oils are used as abherents in the baking industry. Fluorocarbon resin coatings on metals are widely used on cooking utensils.

See antiblock agent; dusting agent.

Abies Siberica oil. See fir needle oil.

abietene. A volatile oil.

Derivation: Distilled from the resin or balsam of *Pinus sabiniana*.

Use: In varnishes and lacquers.

abietic acid. (abietinic acid; sylvic acid).
CAS: 514-10-3. $\text{C}_{19}\text{H}_{29}\text{COOH}$ (having a phenanthrene ring system). A major active ingredient of rosin, where it occurs with other resin acids. The term is often applied to these mixtures, separation of which is not achieved in technical grade material.

Properties: Yellowish, resinous powder. Mp 172–175C, optical rotation -106 . Soluble in alcohol, ether, chloroform, and benzene; insoluble in water. Combustible.

Derivation: Rosin, pine resin, tall oil.

Method of purification: Crystallization.

Grade: Technical.

Use: Abietates (resinates) of heavy metals as varnish driers, esters in lacquers and varnishes, fermentation industries, soaps.

abietinic acid. $\text{C}_{20}\text{H}_{30}\text{O}_2$.

CAS: 514-10-3.

Properties: A crystalline acid with three isomeric forms.

“ABITOL”

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Derivation: From *colophony rosin* and is a solid form or resin obtained from pines and other plants, mostly conifers.

Use: Stimulate growth of lactic and butyric bacteria.

“Abitol” [Eastman]. TM for a colorless, tacky, very viscous liquid; mixture of tetra-, di-, and dehydroabietyl alcohols made from rosin.

Use: Plasticizers, tackifiers, adhesive modifiers.

ablation experiment. An experiment designed to produce an animal deficient in one or a few cell types in order to study cell lineage or cell function. The idea is to make a transgenic mouse with a toxin gene (often a diphtheria toxin) under control of a specialized promoter which activates only in the target cell type. When embryo development progresses to the point where it starts to form the target tissue, the toxin gene is activated, and the target tissue dies. Other tissues are unaffected.

ablative material. Any material that possesses a capability for rapidly dissipating heat from a substrate. Specialized ceramic tiles developed since 1980 for protection of the space shuttle have proved successful. The materials used are of two major types: (1) Fibers made from white silica, fused in an oven, cut into blocks, and coated with borosilicate glass; these are extremely efficient at temperatures up to 2300F. (2) An all-carbon composite (called reinforced carbon-carbon) made by laminating and curing layers of graphite fiber previously coated with a resin, which is pyrolyzed to carbon. The resulting tile is then treated with a mixture of alumina, silicon, and silicon carbide. Such composites are used for maximum-temperature (nose-cone) exposure up to 3000F. Both types are undamaged by the heat and are reusable. The tiles are adhered to the body of the spacecraft with a silicone adhesive. Ablative materials used on early spaceship trials were fluorocarbon polymers and glass-reinforced plastics, but these were wholly or partially decomposed during reentry.

Abram’s law. The strength of concrete depends on the water/cement ratio.

abrasion. Gradual erosion of the surface of a material both by physical forces (simultaneous cutting, shearing, and tearing) and by chemical degradation, chiefly oxidation. Temperature is a significant factor: friction may raise the temperature of the surface layers to the point where they become subject to chemical attack. Abrasion causes deterioration of many materials, especially of rubber (tire treads), where it can be offset by a high percentage of carbon black; other materials subjected to abrasion in their service life are textiles (laundering), leather and plastics (shoe soles, belting), and house paints and automobile lacquers (airborne dust, grit, etc.).

See abrasive.

abrasive. A finely divided, hard, refractory material, ranging from 6 to 10 on the Mohs scale, used to reduce, smooth, clean, or polish the surfaces of other, less hard substances, such as glass, plastic, stone, wood, etc. Natural abrasive materials include diamond dust, garnet, sand (silica), corundum (aluminum oxide, emery), pumice, rouge (iron oxide), and feldspar; the more important synthetic types are silicon carbide, boron carbide, cerium oxide, and fused alumina. Abrasive in powder form may be (1) applied directly to the surface to be treated by mechanical pressure or compressed-air blast, as in cleaning building stone; (2) affixed to paper or textile backing after the particles have been coated with an adhesive; or (3) mixed with a bonding agent such as sodium silicate or clay, the particles being compressed into a wheel rotated by a power-driven shaft. Aluminum grinding wheels are fabricated by bonding industrial diamonds with fluorocarbon polymer (“Teflon”). The process involves reaction of fluorine with the surfaces of the diamonds, chemical bonding of the fluorinated diamonds to the fluorocarbon, and further chemical bonding of the resulting material to the aluminum, with application of heat and pressure.

abrasive, coated. See abrasive (2).

abric acid. A chemical that inhibits digestion and will show as undigested food during an autopsy.

Properties: Contains a tetanic glycoside.

Hazard: Poison.

abrin. (abrus agglutinin; jequiritin; toxalbumin; crab’s eye; Indian licorice seed; jumble bead; prayer bead). Any of the five nearly identical proteinaceous phytotoxins whose a-chain inhibits ribosomal protein synthesis, killing the cell and the b-chain binds to the plasma membrane of the cells of the intestinal wall permitting the a-chain to enter the cytoplasm.

Properties: Chemically similar to botulinum toxin; inactivated by heating; composed of two disulfide-linked polypeptide chains. Molecular weight: 63,000–67,000Da; Yellowish-white powder; soluble in solutions of sodium chloride, usually with turbidity.

Derivation: Produced by the leguminous shrub, *Abrus precatorius*.

Hazard: Extreme irritant; lethal if ingested; toxin; poison.

Abrus. A genus of leguminous plants that produce poisonous lectins or phytotoxins.

ABS. Abbreviation for (1) alkyl benzene sulfonate (detergent); (2) acrylonitrile-butadiene-styrene copolymer.

See ABS resin.

abscisic acid.

CAS: 21293-29-8. $C_{15}H_{20}O_4$. A plant growth regulator that promotes detachment of leaves and fruit.

Properties: Colorless crystals. Mp 160C. Sublimes at 120C. Soluble in acetone, ether, chloroform; slightly soluble in water. Optically active.

Occurrence: In plants, fruits, and vegetables from which it can be extracted. Also made synthetically.

Use: In orchard sprays to facilitate fruit harvesting, defoliant, growth inhibitor.

absinthe. (absinth; *Artemisia absinthium*). A commercially important volatile oil or a highly poisonous alcoholic beverage.

Properties: Contains oil of wormwood, anise, and other herbs.

Derivation: Produced by plants of the genus *Artemisia*.

absinthium. (wormwood). $C_{30}H_{40}O_7$. An essential oil with intensely bitter taste due to presence of absinthin.

Hazard: Toxic by ingestion.

Use: A flavoring in liqueurs, vermouth.

absolute. (1) Free from admixture of other substances; pure. Example: absolute alcohol is dehydrated ethanol, 99% pure. (2) The pure essential oil obtained by double solvent extraction of flowers in the manufacture of perfumes.

See concrete (2). (3) absolute temperature.

absolute alcohol. (anhydrous alcohol; dehydrated alcohol; ethyl alcohol).

CAS: 64-17-5. C_2H_6O . A liquid rapidly absorbed from the gastrointestinal tract and distributed throughout the body. It has bactericidal activity.

Properties: Clear, colorless liquid; 99% ethanol, 1% water.

Use: Reagent in chemical reactions where water must be absent or nearly so; a topical disinfectant; as a solvent and preservative in pharmaceutical preparations; the primary ingredient in alcoholic beverages.

absolute configuration. The configuration of four different substituent groups around an asymmetric carbon atom. The absolute configurations of molecules in biochemistry are compared to the configuration of D- and L-glyceraldehyde.

absolute error. The actual difference between the approximate and the exact value in any calculation.

absolute temperature. The fundamental temperature scale used in theoretical physics and chemistry, and in certain engineering calculations, such as the change in volume of a gas with temperature. Absolute temperatures are expressed either in degrees Kelvin or in degrees Rankine, corresponding respectively to the centigrade and Fahrenheit scales. Temperatures in Kelvins are obtained by adding 273 to the centigrade temperature (if above 0C) or subtracting the centigrade temperature

from 273 (if below 0C). Degrees Rankine are obtained by subtracting 460 from the Fahrenheit temperature.

absolute zero. Temperature at which the volume of a perfect gas theoretically becomes zero and all thermal motion ceases: $-273.13C$ or $-459.4F$.

absorbent. (1) Any substance exhibiting the property of absorption, e.g., absorbent cotton, so made by removal of the natural waxes present. (2) A material that does not transmit certain wavelengths of incident radiation.

See absorption (1); absorption (2).

absorptiometer. An instrument for determining the solubility of a gas in a liquid.

absorption. (1) In chemical terminology, the penetration of one substance into the inner structure of another, as distinguished from adsorption, in which one substance is attracted to and held on the surface of another. Physicochemical absorption occurs between a liquid and a gas or vapor, as in the operation known as scrubbing, in which the liquid is called an absorption oil; sulfuric acid, glycerol, and some other liquids absorb water vapor from the air under certain conditions. Physiological absorption takes place via porous tissues, such as the skin and intestinal walls, which permit passage of liquids and gases into the bloodstream.

See adsorption; hygroscopic. (2) In physical terminology, retention by a substance of certain wavelengths of radiation incident upon it, followed either by an increase in temperature of the substance or by a compensatory change in the energy state of its molecules. The UV component of sunlight is absorbed as the light passes through glass and some organic compounds, the radiant energy being transformed into thermal energy. The radiation-absorptive capacity of matter is utilized in analytical chemistry in various types of absorption spectroscopy. (3) In physical chemistry, the ability of some elements to pick up or "capture" thermal neutrons produced in nuclear reactors as a result of fission. This is due to the capture cross-section of their atoms, which is measured in units called barns; elements of particularly high neutron absorption capability are cadmium and boron.

absorption band. The range of wavelengths absorbed by a molecule; for example, absorption in the infrared band from 2.3 to 3.2 μm indicates the presence of OH and NH groups, while in the band from 3.3 to 3.5 indicates aliphatic structure. Atoms absorb only a single wavelength, producing lines, such as the sodium D line.

See spectroscopy; resonance (2); ultraviolet absorber; excited state.

absorption (biology). Transport of the products of digestion from the intestinal tract into the blood.

ABSORPTION OIL

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absorption oil. See absorption (1).

absorption spectroscopy. An important technique of instrumental analysis involving measurement of the absorption of radiant energy by a substance as a function of the energy incident upon it. Absorption processes occur throughout the electromagnetic spectrum, ranging from the γ region (nuclear resonance absorption or the Mossbauer effect) to the radio region (nuclear magnetic resonance). In practice, they are limited to those processes that are followed by the emission of radiant energy of greater intensity than that which was absorbed. All absorption processes involve absorption of a photon by the substance being analyzed. If it loses the excess energy by emitting a photon of less energy than that absorbed, fluorescence or phosphorescence is said to occur, depending on the lifetime of the excited state. The emitted energy is normally studied. If the source of radiant energy and the absorbing species are in identical energy states (in resonance) the excess energy is often given up by the nondirectional emission of a photon whose energy is identical with that absorbed. Either absorption or emission may be studied, depending upon the chemical and instrumental circumstances. If the emitted energy is studied, the term *resonance fluorescence* is often used. However, if the absorbing species releases the excess energy in small steps by intermolecular collision or some other process, it is commonly understood that this phenomenon falls within the realm of absorption spectroscopy. The terms *absorption spectroscopy*, *spectrophotometry*, and *absorptiometry* are often used synonymously. Most absorption spectroscopy is done in the ultraviolet, visible, and infrared regions of the electromagnetic spectrum.

See emission spectroscopy; infrared spectroscopy.

absorption tower. (scrubber; Paulson tower). A device used for gas purification by absorption of gas impurities in a liquid.

ABS resin. Any of a group of tough, rigid thermoplastics that derive their name from the initial letters of the monomers which produce them.

abstraction reaction. A reaction that removes an atom from a structure.

abundance. The relative amount (% by weight) of a substance in the earth's crust, including the atmosphere and the oceans. (1) The abundance of the elements in the earth's crust is:

Rank	Element	% by wt
1	Oxygen	49.2
2	Silicon	25.7
3	Aluminum	7.5
4	Iron	4.7
5	Calcium	3.4

6	Sodium	2.6
7	Potassium	2.4
8	Magnesium	1.9
9	Hydrogen	0.9
10	Titanium	0.6
11	Chlorine	0.2
12	Phosphorus	0.1
13	Manganese	0.1
14	Carbon	0.09
15	Sulfur	0.05
16	Barium	0.05
	All others	0.51

(2) The percentages of inorganic compounds in the earth's crust, exclusive of water, are:

(1) SiO ₂	55	(2) Al ₂ O ₃	15	(3) CaCO ₃	8.8
(4) MgO	1.6	(5) Na ₂ O	1.6	(6) K ₂ O	1.9

(3) The most abundant organic materials are cellulose and its derivatives, and proteins.

Note: In the universe as a whole, the most abundant element is hydrogen.

"Abzol" [Albemarle]. TM for a solvent cleaner that can be used in place of chlorinated solvents. The main ingredient is n-propyl bromide and is an acceptable substitute for ozone-depleting substances.

Use: Electronic equipment and close tolerance metal parts.

AC. Abbreviation for allyl chloride.

Ac. Symbol for actinium; abbreviation for acetate.

acacia gum. See arabic gum.

acaricide. A type of pesticide effective on mites and ticks (acaricides).

ACC. See the American Chemistry Council.

accelerator. (1) A compound, usually organic, that greatly reduces the time required for vulcanization of natural and synthetic rubbers, at the same time improving the aging and other physical properties. Organic accelerators invariably contain nitrogen, and many also contain sulfur. The latter type are called ultra-accelerators because of their greater activity. The major types include amines, guanidines, thiazoles, thiuram sulfides, and dithiocarbamates. The amines and guanidines are basic, the others acidic. The normal effective concentration of organic accelerators in a rubber mixture is 1% or less depending on the rubber hydrocarbon present. Zinc oxide is required for activation, and in the case of acidic accelerators, stearic acid is required. The introduction of organic accelerators in the early twenties was largely responsible for the successful development of automobile tires and

mechanical products for engineering uses. A few inorganic accelerators are still used in low-grade products, e.g., lime, magnesium oxide, and lead oxide.

See vulcanization; rubber. (2) A compound added to a photographic developer to increase its activity, such as certain quaternary ammonium compounds and alkaline substances. (3) A particle accelerator.

“Accepta” [Accepta]. TM for a rig wash concentrated detergent miscible with fresh or sea waters.

Use: Cleaning in the shipping industry.

“Accepta 3538” [Accepta]. TM for an emulsifying bilge cleaner and degreaser.

“Accepta 3547” [Accepta]. TM for a water stain and scale remover.

Use: For steel, wood, glazed surfaces, toilet bowls, baths, and terrazzo.

acceptability (foods). See organoleptic.

acceptable risk. A concept that has developed in recent years, especially in connection with toxic substances (insecticides, mercurials, carcinogens), food additives, air and water pollution, and related environmental concerns. It may be defined as a level of risk at which a seriously adverse result is highly unlikely to occur, “but at which one *cannot* prove whether *or not* there is 100% safety. It means living with reasonable assurance of safety and acceptable uncertainty.” (Schmutz, J. F., *Chemical and Engineering News*, Jan. 16, 1978). Examples of acceptable risk that might be cited are diagnostic X-rays, fluoridation of water, and ingestion of saccharin in normal amounts. The acceptability of the risks involved in nuclear power generation is controversial. The weight of the evidence has tended to shift toward the negative side since 1975 when an official safety study estimated the risk of a serious accident to be 1 in 20,000 years of reactor operation. An investigation made by the Oak Ridge National Laboratory based on data collected from 1969 to 1979 concluded that the risk of a major accident is 1 in 1000 years of reactor operation.

acceptor. See donor.

acceptor control. (electron transport chain). The regulation of the rate of respiration by the availability of ADP as a phosphate group acceptor.

accessory pigments. Visible light-absorbing pigments, such as carotenoids and xanthophyll in green plants and photosynthetic bacteria that trap energy from sunlight and pass it on to “special pairs.”

“Accosoft” [Stepan]. TM for a product that adds softening, lubricity, and heat resistance.

Use: In household and commercial textile industries.

“Accuchem” [Accurate]. TM for a series of research biochemical compounds.

“Accudenz” [Accurate]. TM for an autoclavable, universal centrifugation medium.

AccuGel. A native pea starch.

Use: Gives excellent gel strength, improved body and mouth feel without adding flavors.

“acutane”[®]. [F. Hoffman]. (Isotretinoin, 13-*cis*-retinoic acid).

CAS: 4759-48-2. C₂₀H₂₈O₂. A chemical that is related to both retinoic acid and retinol (Vitamin A).

Properties: Yellow to orange crystalline powder; molecular weight: 300.44.

Hazard: Teratogen.

Use: Medicine to treat acne and other skin diseases.

aceclidine. (3-acetoxyquinuclidine glucostat; 3-quinuclidinyl acetate; 1-azabicyclo[2.2.2]octan-8-yl).

CAS: 827-61-2. C₉H₁₅NO₂. The acetate ester of quinuclidinol.

Use: A cholinergic warfare agent.

acenaphthene. (1,8-dihydroacenaphthalene; ethylenenaphthalene).

CAS: 83-32-9. C₁₀H₆(CH₂)₂ (a tricyclic compound).

Properties: White needles. D 1.024 (99/4C), fp 93.6C, bp 277.5C, refr index (100C) 1.6048. Soluble in hot alcohol; insoluble in water. Combustible.

Derivation: From coal tar.

Grade: Technical, 98%.

Hazard: Questionable carcinogen.

Use: Dye intermediate, pharmaceuticals, insecticide, fungicide, plastics.

acenaphthenequinone. (1,2-acenaphthenedione). C₁₀H₆(CO)₂ (a tricyclic compound).

Properties: Yellow needles. Mp 261–263C. Insoluble in water; soluble in alcohol.

Derivation: By oxidizing acenaphthene, using glacial acetic acid and sodium or potassium dichromate.

Grade: Technical.

Use: Dye synthesis.

acenocoumarin. (3-(α -acetyl-4-nitrobenzyl)-4-hydroxycoumarin).

CAS: 152-72-7. C₁₉H₁₅NO₆.

Properties: White, crystalline powder; tasteless and odorless. Mp 197C. Slightly soluble in water and organic solvents.

Use: Medicine (anticoagulant).

acephate. (acetylphosphoramidothioic acid ester).

CAS: 30560-19-1. C₄H₁₀NO₃PS.

ACEPHATEMET

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Properties: White crystals. Mp 65C. Soluble in water; slightly soluble in acetone and alcohol.

Hazard: Moderately toxic by ingestion. Possible carcinogen.

Use: Insecticide.

Accephatemet. $C_2H_8NO_2PS$

CAS: 10265-92-6.

Properties: White crystalline structure; slightly water-soluble; melting point: 39–41C.

Use: Insecticide to control cutworms and borers.

acerola. The fruit of the West Indian cherry, *Malpighia puniceifolia*, that is the most concentrated natural source of ascorbic acid known.

ACerS. See American Ceramic Society.

acetadol. See aldol.

acetal. (diethylacetal; 1,1-diethoxyethane; ethylenediethyl ether).

CAS: 105-57-7. $CH_3CH(OC_2H_5)_2$.

Properties: Colorless, volatile liquid; agreeable odor; nutty aftertaste. D 0.831, bp 103–104C, vap press 20.0 mm (20C), flash p –5F (CC) (–20.5C), specific heat 0.520, refr index 1.38193 (20C), wt (lb/gal) 6.89, autoign temp 446F (230C). Stable to alkalis but readily decomposed by dilute acids. Forms a constant-boiling mixture with ethanol. Soluble in alcohol, ether, and water.

Derivation: Partial oxidation of ethanol, the acetaldehyde first formed condensing with the alcohol.

Grade: Technical.

Hazard: Highly flammable, dangerous fire risk. Explosive limits in air 1.65–10.4%. Moderately toxic and narcotic in high concentrations.

Use: Solvent, cosmetics, organic synthesis, perfumes, flavors.

See acetal resin.

acetaldehyde. (acetic aldehyde; aldehyde; ethanal; ethyl aldehyde).

CAS: 75-07-0. CH_3CHO .

Properties: Colorless liquid; pungent, fruity odor. D 0.783 (18/4C), bp 20.2C, mp –123.5C, vap press 740.0 mm (20C), flash p –40F (–40C) (OC), specific heat 0.650, refr index 1.3316 (20C), wt 6.50 lb/gal (20C). Miscible with water, alcohol, ether, benzene, gasoline, solvent naphtha, toluene, xylene, turpentine, and acetone.

Derivation: (1) Oxidation of ethylene; (2) vapor-phase oxidation of ethanol; (3) vapor-phase oxidation of propane and butane; (4) catalytic reaction of acetylene and water (chiefly in Germany).

Grade: Technical 99%.

Hazard: Highly flammable, toxic (narcotic). Dangerous fire, explosion risk, explosive limits in air 4–57%. Possible carcinogen, eye, and upper respiratory tract irritant.

Use: Manufacture of acetic acid and acetic anhydride, *n*-butanol, 2-ethylhexanol, peracetic acid, aldol, pentaerythritol, pyridines, chloral, 1,3-butylene glycol, and trimethylolpropane; synthetic flavors.

acetaldehyde ammonia. See aldehyde ammonia.

acetaldehyde cyanohydrin. See lactonitrile.

Acetaldehyde dehydrogenase.

CAS: 9028-86-8. An enzyme that rapidly converts acetaldehyde into the less harmful acetic acid.

acetal resin. (polyacetal). A polyoxymethylene thermoplastic polymer obtained by ionically initiated polymerization of formaldehyde + CH_2 to obtain a linear molecule of the type $-O-CH_2-O-CH_2=CH_2-$. Single molecules may have over 1500 $-CH_2-$ units. As the molecule has no side chains, dense crystals are formed. Acetal resins are hard, rigid, strong, tough, and resilient; dielectric constant 3.7; dielectric strength 1200 volts/mil, 600 volts/mil (80-mil); dimensionally stable under exposure to moisture and heat; resistant to chemicals, solvents, flexing, and creep, and have a high gloss and low friction surface. Can be chromium plated, injection-molded, extruded, and blow-molded. Not recommended for use in strong acids or alkalis. They may be homopolymers or copolymers.

Properties: D 1.425, thermal conductivity 2.6 Btu-in/(hr * ft^2 * degF), coefficient of thermal expansion 4.5×10^{-5} /degree F, specific heat 0.35 Btu/(lb)(degree F), water absorption 0.41%/24 hour, tensile strength 10,000 psi, elongation 15%, hardness (Rockwell) R120, impact strength (notched) 1.4 ft-lb/inch, flexural strength 14,100 psi, shear strength 9500 psi. Combustible, but slow burning.

Use: An engineering plastic, often used as substitute for metals, as in oil and gas pipes; automotive and appliance parts; industrial parts; hardware; communication equipment; aerosol containers for cosmetics.

See "Delrin" [Du Pont]; "Celcon" [CNA].

acetamide. (acetic acid amine; ethanamide).

CAS: 60-35-5. CH_3CONH_2 .

Properties: Colorless, deliquescent crystals; mousy odor. D 1.159, mp 80C, bp 223C, refr index 1.4274 (78.3C). Soluble in water and alcohol; slightly soluble in ether. Combustible.

Derivation: Interaction of ethyl acetate and ammonium hydroxide.

Grade: Technical, CP (odorless), intermediate, reagent.

Hazard: A possible carcinogen.

Use: Organic synthesis (reactant, solvent, peroxide stabilizer), general solvent, lacquers, explosives,

soldering flux, hygroscopic agent, wetting agent, penetrating agent.

acetamidine hydrochloride. $C_2H_6N_2HCl$.

Properties: Crystalline solid. Slightly deliquescent. Mp 166C. Soluble in water and alcohol; insoluble in acetone. Keep stoppered.

Derivation: Alcohol solution of acetonitrile + HCl + ammonia.

Hazard: Skin irritant, moderately toxic by ingestion.

Use: Synthesis of pyrimidines and related groups of biochemically active compounds.

acetamido- Prefix indicating the group CH_3CONH- . Also called acetamino- or acetylamino-.

3-acetamido-5-aminobenzoic acid.

Use: Intermediate in the manufacture of X-ray contrast media.

5-acetamido-8-amino-2-naphthalenesulfonic acid. (acetyl-1,4-naphthalenediamine-7-

sulfonic acid; acetyl-amino-1,6-Cleve's acid). $C_{10}H_5NHCOC_2H_5(NH_2)(SO_3H)$. A reddish-brown paste.

Hazard: Toxic.

Use: Chemical intermediate, dyes.

8-acetamido-5-amino-2-naphthalenesulfonic acid. (acetyl-1,4 - naphthalenediamine-6-

sulfonic acid; acetyl-amino-1,7-Cleve's acid). $C_{10}H_5(NHCOC_2H_5)(NH_2)(SO_3H)$.

Properties: Paste.

Hazard: Toxic.

Use: A chemical intermediate and in dyes.

p-acetamidobenzenesulfonyl chloride. See *N*-acetylsulfanilyl chloride.

((p-acetamidobenzoyl)oxy)tributylstannane.

See tributyltin-*p*-acetamidobenzoate.

acetamidocyanoacetic ester. See ethyl acetamidocyanoacetate.

4-acetamido-2-ethoxybenzoic acid methyl ester. See ethopabate.

8-acetamido-2-naphthalenesulfonic acid magnesium salt. (acetyl-1,7-Cleve's acid).

$[C_{10}H_6(CH_3CONH)(SO_3)]_2Mg$.

Properties: Brownish-gray paste containing approximately 80% solids.

Use: Intermediate for dyes.

p-acetamidophenol. See *p*-acetylaminophenol.

Acetamine. A group of azo dyes and developers made for application to acetate yarn, and especially suited to nylon.

acetamino- See acetamido-.

acetaminophen. See *p*-acetylaminophenol.

acetanilide. (*N*-phenylacetamide).

CAS: 103-84-4. $C_6H_5NH(COCH_3)$.

Properties: White, shining crystalline leaflets or white, crystalline powder; odorless; slightly burning taste. Stable in air. D 1.2105, mp 114–116C, bp 303.8C. Soluble in hot water, alcohol, ether, chloroform, acetone, glycerol, and benzene. Flash p 345F (174C); autoign temp 1015F (545C). Combustible.

Derivation: Acetylation of aniline with glacial acetic acid.

Grade: Technical, CP.

Hazard: Toxic by ingestion.

Use: Rubber accelerator, inhibitor in hydrogen peroxide, stabilizer for cellulose ester coatings, manufacture of intermediates (*p*-nitroaniline, *p*-nitroacetanilide, *p*-phenylenediamine), synthetic camphor, pharmaceutical chemicals, dyestuffs, precursor in penicillin manufacture, medicine (antiseptic), acetanisole.

See *p*-methoxyacetophenone.

acetate. (1) A salt of acetic acid in which the terminal hydrogen atom is replaced by a metal, as in copper acetate, $Cu(CH_3COO)_2$. (2) An ester of acetic acid where the substitution is by a radical as in ethyl acetate, $CH_3COOC_2H_5$. In cellulose acetate the hydroxyl radicals of the cellulose are involved in the esterification.

See cellulose acetate; vinyl acetate.

acetate dye. One group consists of water insoluble azo or anthraquinone dyes that have been highly dispersed to make them capable of penetrating and dyeing acetate fibers. A second class group comprises water-insoluble amino azo dyes that are made water soluble by treatment with formaldehyde and bisulfite. After absorption by the fiber, the resulting sulfonic acids hydrolyze and regenerate the insoluble dyes.

acetate fiber. A manufactured fiber in which the fiber-forming substance is cellulose acetate. Where not less than 92% of the hydroxyl groups are acetylated, the term *triacetate* may be used as a generic description of the fiber (Federal Trade Commission). This fiber was formerly called acetate rayon or acetate silk. The term rayon is not permissible for this type.

Properties: Thermoplastic; becomes tacky at 350F (176C). Moisture absorption 6%. Tenacity 1.4 g/denier (dry); about 1 g/denier (wet). Elongation 50% dry, 40% wet. Soluble in acetone and glacial acetic acid; decomposed by concentrated solutions of strong acids and alkalis. Combustible.

Use: Wearing apparel, industrial fabrics.

See cellulose acetate; cellulose triacetate.

ACETATE FIBER, SAPONIFIED

8

acetate fiber, saponified. Regenerated cellulose fibers obtained by complete saponification of highly oriented cellulose acetate fibers.

Properties: Tensile strength (psi) 136,000–155,000; elongation 6%; d 1.5–1.6; moisture regain 9.6–10.7%; decomposes at about 149C. Similar to cotton in chemical resistance, dyeing, and resistance to insects and mildew. Combustible.

Available forms: Available in continuous filament form having a high degree of crystallinity and great strength.

Use: Cargo parachutes, typewriter ribbons, belts, webbing, tapes, carpet backing.

acetate film. A durable, highly transparent film with nondeforming characteristics produced from cellulose acetate resin. It is grease, oil, dust, and air proof and hygienic. Combustible.

Available forms: Rolls and cut-to-size sheets.

Use: Laminates, support for photographic film, document preservation, pressure-sensitive tape, magnetic sound-recording tape, window cartons, envelope packaging.

acetate kinase. (acetokinase). A phosphotransferase that catalyzes the formation of acetyl phosphate from ATP and acetate.

acetate of lime. Commercial term for calcium acetate made from pyrolygneous acid and milk of lime. There are brown and gray acetates of lime. See calcium acetate.

acetate process. See cellulose acetate.

acetate rayon. The yarn made from refined wood cellulose by the acetate process. See acetate fiber.

acetate rayon process. In this process cellulose is combined with acetic anhydride to make cellulose acetate, which is dissolved in acetone and forced through spinnerette holes into a precipitating bath. See acetate fiber.

acethydrazidepyridinium chloride. See Girard's reagent.

acetic acid. (ethanoic acid; vinegar acid; methanecarboxylic acid).

CAS: 64-19-7. (CH₃COOH). Glacial acetic acid is the pure compound (99.8% min), as distinguished from the usual water solutions known as acetic acid.

Properties: Clear, colorless liquid; pungent odor. Mp 16.63C, bp 118C (765 mm Hg), 80C (202 mm Hg), d 1.0492 (20/4C), wt/gal (20C) 8.64 lb, viscosity (20C) 1.22 cP, flash p 110F (43C) (OC), refr index 1.3715 (20C), autoign temp 800F (426C). Combustible. Miscible with water, alcohol, glycerol, and ether; insoluble in carbon disulfide.

Derivation: (a) Liquid- and vapor-phase oxidation of petroleum gases (with catalyst), (b) oxidation

of acetaldehyde, (c) reaction of methanol and carbon monoxide (with catalyst; this is the most cost-efficient method and has been in general use for some years), (d) fermentative oxidation of ethanol.

Grade: USP (glacial, 99.4 wt%, and dilute, 36–37 wt%), CP, technical (80, 99.5%), commercial (6, 28, 30, 36, 56, 60, 70, 80, and 99.5%), NF (diluted 6.0 g/100 mL).

Hazard: Moderate fire risk. Pure acetic acid is moderately toxic by ingestion and inhalation, but dilute material is approved by FDA for food use. Strong irritant to eyes, skin, and tissue; upper respiratory tract irritant and pulmonary function effects.

Use: Manufacturing of acetic anhydride, cellulose acetate, and vinyl acetate monomer; acetic esters; chloroacetic acid; production of plastics, pharmaceuticals, dyes, insecticides, photographic chemicals, etc.; food additive (acidulant); latex coagulant; oil-well acidizer; textile printing.

See vinegar.

acetic acid amine. See acetamide.

acetic acid benzyl ester. See benzyl acetate.

acetic acid, glacial. See acetic acid.

acetic acid, ((octylstannylidyne)trithio)tri-, tris(2-ethylhexyl) ester. See octyltris(2-ethylhexyloxycarbonylmethylthio)stannane.

acetic acid phenylmethyl ester. See benzyl acetate.

acetic aldehyde. See acetaldehyde.

acetic anhydride. (acetyl oxide; acetic oxide). CAS: 108-24-7. (CH₃CO)₂O.

Properties: Colorless, mobile, strongly refractive liquid; strong odor. D 1.0830 (20/20C), bp 139.9C, fp –73.1C, flash p 121F (49.4C) (CC), autoign temp 732F (385C), wt/gal 9.01 lb (20C). Miscible with alcohol, ether, and acetic acid; soluble in cold water; decomposes in hot water to form acetic acid. Combustible.

Derivation: (1) Oxidation of acetaldehyde with air or oxygen with catalyst; (2) by catalyzed thermal decomposition of acetic acid to ketone; (3) reaction of ethyl acetate and carbon monoxide; (4) from carbon monoxide and methanol.

Grade: CP, technical (75, 85, 90–95%).

Hazard: Strong irritant and corrosive; may cause burns and eye damage. Moderate fire risk. Eye and upper respiratory tract irritant. Questionable carcinogen.

Use: Cellulose acetate fibers and plastics; vinyl acetate; dehydrating and acetylating agent in production of pharmaceuticals, dyes, perfumes, explosives; etc., aspirin. Esterifying agent for food starch (5% max).

acetic ester. See ethyl acetate.

acetic ether. See ethyl acetate.

acetic oxide. See acetic anhydride.

acetin. (monoacetin; glyceryl monoacetate).
CAS: 102-76-1. $C_3H_5(OH)_2OOCCH_3$. Acetin may also refer to glyceryl di- or triacetate, also known as diacetin and triacetin.

Properties: Colorless, thick liquid. Hygroscopic. D 1.206 (20/4C), bp 158C (165 mm), 130C (3 mm). Soluble in water, alcohol; slightly soluble in ether; insoluble in benzene. Combustible.

Derivation: By heating glycerol and strong acetic acid, distilling off the weak acetic acid formed, and again heating with strong acetic acid and distilling.

Method of purification: Rectification.

Hazard: Moderately toxic, irritant.

Use: Tanning; solvent for dyes, food additive, gelatinizing agent in explosives.

acetoacetanilide. (acetylacetanilide).

CAS: 102-01-2. $CH_3COCH_2CONHC_6H_5$.

Properties: White, crystalline solid. Mp 85C, d 1.26, flash p 325F (162.7C). Resembles ethyl acetoacetate in chemical reactivity. Slightly soluble in water; soluble in dilute sodium hydroxide, alcohol, ether, acids, chloroform, and hot benzene. Combustible.

Derivation: By reacting ethyl acetoacetate with aniline, and eliminating ethanol. Acetoacetanilide may also be prepared from aniline and diketene.

Grade: Technical.

Use: Organic synthesis; dyestuffs (intermediate in the manufacture of the dry colors generally referred to as Hansa and benzidine yellows).

acetoacet-o-anisidide.

$CH_3COCH_2CONHC_6H_4OCH_3$.

Properties: White, crystalline powder. Mp 86.6C, d 1.1320 (86.6/20C), flash p 325F (162.7C) (OC). Combustible.

Use: Intermediate for azo pigments.

acetoacet-o-chloranilide.

CAS: 93-70-9. $CH_3COCH_2CONHC_6H_4Cl$.

Properties: White, crystalline powder. Mp 107C, bp (decomposes), d 1.1920 (107/20C), flash p 350F (176.6C) (OC). Almost insoluble in water. Combustible.

Hazard: Toxic by ingestion.

Use: Intermediate for azo pigments.

acetoacet-p-chloranilide.

$CH_3COCH_2CONHC_6H_4Cl$.

Properties: White, crystalline powder. Mp 133C, bp (decomposes), flash p 320F (160C) (OC). Combustible. Very slightly soluble in water.

Hazard: Toxic by ingestion.

Use: Intermediate for azo pigments.

acetoacetic acid. (acetylacetic acid; diacetic acid; acetone carboxylic acid). CH_3COCH_2COOH .

Properties: Colorless, oily liquid. Soluble in water, alcohol, and ether; decomposes below 100C into acetone and carbon dioxide.

Hazard: Irritant to eyes and skin.

Use: Organic synthesis.

acetoacet-p-phenetide.

$CH_3COCH_2CONHC_6H_4OCH_2CH_3$.

Properties: Crystalline powder. Mp 108.5C, bp (decomposes), d 1.0378 (108.5/20C), flash p 325F (162.7C) (OC). Combustible.

Hazard: Moderately toxic by ingestion.

Use: Intermediate for azo pigments.

acetoacet-o-toluidide.

$CH_3COCH_2CONHC_6H_4CH_3$.

Properties: Fine, white, granular powder. Mp 106C, bp (decomposes), d 1.062 (106C). Slightly soluble in water. Flash p 320F (160C). Combustible.

Grade: Technical.

Hazard: Moderately toxic.

Use: Intermediate in the manufacture of Hansa and benzidine yellows.

acetoacet-p-toluidide.

$CH_3COCH_2CONHC_6H_4CH_3$.

Properties: White, crystalline powder. Mp 93.0–96.0C, purity 99% min.

Hazard: Moderately toxic.

Use: Light-fast yellow pigment intermediate; diazo coupler.

acetoacet-m-xylidide. (AAMX).

$(CH_3)_2C_6H_3NHCOCH_2COCH_3$.

Properties: White to light-yellow crystals. Mp 89–90C, d 1.238 (20C). Water solubility 0.5% (25C). Flash p 340F (171C); combustible.

Use: Intermediate for yellow pigments.

acetoacetate. (3-oxobutanoic acid).

CAS: 105-45-3. $C_4H_5O_3$.

Properties: Salt or ion of acetoacetic acid; can spontaneously release carbon dioxide, forming acetone.

acetoaminofluorene. A pesticide. May not be used in food products or beverages (FDA).

Hazard: Toxic by ingestion.

p-acetoanisole. See p-methoxyacetophenone.

acetoglyceride. Usually an acetylated mono-glyceride, although commercial acetoglycerides will contain di- and triglycerides.

See acetostearin.

acetoin. See acetylmethylcarbinol.

acetol. See hydroxy-2-propanone.

acetolysis. The procedure whereby acetyl compounds are treated with alcoholic or aqueous alkalis to remove the acetyl groups.

ACETOMEROCTOL

10

acetomerocetol.

$$\text{CH}_3\text{COOHgC}_6\text{H}_5(\text{OH})\text{C}(\text{CH}_3)_2\text{CH}_2\text{C}(\text{CH}_3)_3.$$

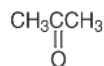
Properties: White solid. Mp 155–157°C. Freely soluble in alcohol; soluble in ether, chloroform; sparingly soluble in benzene; insoluble in water.

Hazard: Toxic by ingestion.

Use: Medicine (antiseptic, solution 1:1000).

acetone. (dimethylketone; 2-propanone).

CAS: 67-64-1. $\text{CH}_3\text{COCH}_3.$



Properties: Colorless, volatile liquid; sweetish odor. Mp -94.3°C, bp 56.2°C, refr index 1.3591 (20°C), d 0.792 (20/20°C), wt/gal 6.64 lb (15°C), flash p 15F (-9.4°C) (OC), autoign temp 1000F (537°C). Miscible with water, alcohol, ether, chloroform, and most oils.

Derivation: (1) Oxidation of cumene; (2) dehydrogenation or oxidation of isopropyl alcohol with metallic catalyst; (3) vapor-phase oxidation of butane; (4) by-product of synthetic glycerol production.

Grade: Technical; CP; NF; electronic; spectrophotometric.

Hazard: Flammable, dangerous fire risk. Explosive limits in air 2.6–12.8%. Narcotic in high concentrations. Moderately toxic by ingestion and inhalation. Eye and upper respiratory tract irritant, central nervous system impairment, and hematologic effects. Questionable carcinogen.

Use: Chemicals (methyl isobutyl ketone; methyl isobutyl carbinol; methyl methacrylate; bisphenol-A); paint, varnish, and lacquer solvent; cellulose acetate, especially as spinning solvent; to clean and dry parts of precision equipment; solvent for potassium iodide and permanganate; delusterant for cellulose acetate fibers; specification testing of vulcanized rubber products.

acetone bromoform. See tribromo-*tert*-butyl alcohol.

acetonecarboxylic acid. See acetoacetic acid.

acetone chloroform. See chlorobutanol.

acetone cyanohydrin. (α -hydroxyisobutyronitrile; 2-methylactonitrile).

CAS: 75-86-5. $(\text{CH}_3)_2\text{COHCN}.$

Properties: Colorless liquid. Bp 82°C (23 mm), mp -20°C, d 0.932 (19°C), refr index 1.3996 (20°C), flash p 165F (73.9°C), autoign temp 1270F (685°C). Soluble in alcohol and ether. Combustible.

Derivation: Condensing acetone with hydrocyanic acid.

Grade: Technical (97–98% pure).

Hazard: Toxic. Readily decomposes to hydrocyanic acid and acetone. Upper respiratory tract irritant, headache, hypoxia, and cyanosis.

Use: Insecticides; intermediate for organic synthesis, especially methyl methacrylate.

acetonedicarboxylic acid. See β -ketoglutaric acid.

acetone number. The degree of polymerization of a bodied vegetable oil, measured by the amount of matter that is insoluble in acetone.

acetone oxime. See acetoxime.

acetone semicarbazone. $(\text{CH}_3)_2\text{CNNHCONH}_2.$ A chemical intermediate.

Properties: White powder. Mp 188°C.

acetone sodium bisulfate. See sodium acetone bisulfate.

acetoneitrile. (methyl cyanide).

CAS: 75-05-8. $\text{CH}_3\text{CN}.$

Properties: Colorless, limpid liquid; aromatic odor. D 0.783; mp -41°C; bp 82°C; flash p 42F (5.56°C). Soluble in water and alcohol; high dielectric constant; high polarity; strongly reactive.

Derivation: By-product of propylene-ammonia process for acrylonitrile.

Grade: Technical; nanograde; spectrophotometric.

Hazard: Flammable, dangerous fire risk. Toxic action by skin absorption and inhalation. Lower respiratory tract irritant. Questionable carcinogen.

Use: Solvent in hydrocarbon extraction processes, especially for butadiene; specialty solvent; intermediate; catalyst; separation of fatty acids from vegetable oils; manufacturing of synthetic pharmaceuticals.

acetonylacetone. (1,2-diacetylene; hexanedione-2,5; 2,5-diketohexane).

CAS: 110-13-4. $\text{CH}_3\text{COCH}_2\text{CH}_2\text{COCH}_3.$

Properties: Colorless liquid. D 0.9734 (20/20°C); bp 192.2°C; vap press 0.43 mm at 20°C; fp -5.4°C; flash p 185F (85°C); bulk d 8.2 lb/gal (20°C). Combustible; autoign temp 920F (493°C). Soluble in water.

Derivation: By-product in the production of acetaldehyde from acetylene.

Grade: Technical.

Hazard: Irritant to eyes and skin.

Use: Solvent for cellulose acetate, roll-coating inks, lacquers, stains; intermediate for pharmaceuticals and photographic chemicals; electroplating.

acetonyl alcohol. See hydroxy-2-propanone.

3-(α -acetonylbenzyl)-4-hydroxycoumarin.

See Warfarin.

3-(α -acetonylfurfuryl)-4-hydroxycoumarin.

(sodium salt also used). A rodenticide.

Hazard: Highly toxic by ingestion and inhalation.

3-(α -acetonyl-4-nitrobenzyl)-4-

hydroxycoumarin. See acenocoumarin.

(s)-acetophan. See sinorphan.

acetophenetidin. (*p*-acetylphenetidid; acetophenetidide; phenacetin; *p*-ethoxyacetanilide).
CAS: 62-44-2. $\text{CH}_3\text{CONHC}_6\text{H}_4\text{OC}_2\text{H}_5$.

Properties: White crystals or powder; odorless and stable in air. Mp 135C. Soluble in alcohol, chloroform, and ether; slightly soluble in water; has slightly bitter taste.

Derivation: By the interaction of *p*-phenetidid and glacial acetic acid or of ethyl bromide and *p*-acetaminophenol.

Method of purification: Crystallization.

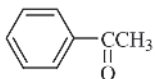
Grade: Technical; USP, as phenacetin.

Hazard: Toxic by ingestion. Upper respiratory tract irritant, central nervous system impairment, and pregnancy loss. Confirmed carcinogen.

Use: Medicine (analgesic); veterinary medicine.

acetophenone. (phenylmethylketone; hypnone; acetylbenzene).

CAS: 98-86-2. $\text{C}_6\text{H}_5\text{COCH}_3$.



Properties: Colorless liquid; sweet, pungent odor and taste. Bp 201.7, fp 19.7C, d 1.030 (20/20C), bulk d 8.56 lb/gal (20C), refr index 1.5363 (20C), flash p 180F (82.2C) (COC). Slightly soluble in water; soluble in organic solvents and sulfuric acid. Combustible.

Derivation: (1) Friedel-Crafts process with benzene and acetic anhydride or acetyl chloride; (2) by-product from the oxidation of cumene; (3) oxidation of ethylbenzene.

Method of purification: Distillation and crystallization.

Grade: Technical, refined, perfumery.

Hazard: Narcotic in high concentrations, hypnotic.

Use: Perfumery; solvent; intermediate for pharmaceuticals, resins, etc.; flavoring; polymerization catalyst; organic synthesis.

acetophenone oxime.

Properties: Crystals.

Use: Antiozonant properties, antioxidant, antiskinning agent, piezoelectric properties, emulsifier-water/oleoresinous systems, end blocker, polymerization short stopper.

acetostearin.

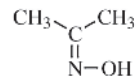
$\text{CH}_3(\text{CH}_2)_{16}\text{COOCH}_2\text{CH}_2\text{OCH}_2\text{OOCCH}_3$.

Acetylated glyceryl monostearate. Solid with peculiar combination of flexibility and nongreasiness. Derived from glyceryl monostearate or mixed glycerides by acetylation with acetic anhydride.

Use: Protective coating for food and as a plasticizer.

acetotoluidide. See acetyl-*o*-toluidine; acetyl-*p*-toluidine.

acetoxime. (acetone oxime; 2-propanone oxime). $(\text{CH}_3)_2\text{CNOH}$.



Properties: Colorless crystals; chloral-like odor. Both basic and acidic in properties. Volatilizes in air. D 0.97 (20/20C), bp 136.3C, mp 61C. Fairly easily hydrolyzed by dilute acids; soluble in alcohols, ethers, water. Combustible.

Derivation: Reaction of hydroxylamine in water solution with acetone, followed by ether extraction.

Grade: Technical.

Use: Organic synthesis (intermediate); solvent for cellulose ethers; primer for diesel fuels.

***o*-acetoxibenzoic acid.** See aspirin.

acetoxylation. A method of synthesizing ethylene glycol in which ethylene is reacted with acetic acid in the presence of a catalyst, such as tellurium bromide, resulting in the formation of mixed mono- and diacetates; this is followed by hydrolysis to ethylene glycol and acetic acid, with up to 95% yield of the glycol. It is thus considerably more efficient than the ethylene oxide method.

acetoxidiethylphenylstannane. See diethyl phenyltin acetate.

acetoxydiphenylethylstannane. See ethyldiphenyltin acetate.

4-(*p*-acetoxylphenyl)-2-butanone. See cue-lure.

(*p*-acetoxylphenyl)methyl carbinol. See 4-acetoxylphenyl methyl carbinol-4-acetoxylphenyl methyl carbinol.

4-acetoxylphenyl methyl carbinol-4-acetoxylphenyl methyl carbinol.

CAS: 53744-50-6. $\text{C}_{10}\text{H}_{12}\text{O}_3$.

Hazard: Toxic by ingestion. A severe skin irritant.

α -acetoxyltoluene. See benzyl acetate.

acetoxyltriethylstannane.

CAS: 1907-13-7. $\text{C}_8\text{H}_{18}\text{O}_2\text{Sn}$.

Hazard: A poison by ingestion.

acetoxyltriethyltin. See acetoxyltriethylstannane.

acetoxyltriethylstannane.

CAS: 2897-46-3. $\text{C}_{20}\text{H}_{42}\text{O}_2\text{Sn}$.

Hazard: A poison by skin contact. Moderately toxic by ingestion.

acetoxyltriethyltin. See acetoxyltriethylstannane.

ACETOXYTRIISOPROPYLSTANNANE 12

acetoxytriisopropylstannane. See triisopropyltin acetate.

acetoxytrimethylstannane. See trimethyltin acetate.

acetoxytripropylstannane. See tripropyltin acetate.

acetoxytris(β,β -dimethylphenethyl)stannane. See trineophyltin acetate.

acetozone. See acetylbenzoyl peroxide.

“Acetulan” [Lubrizol]. TM for a special fraction of acetylated lanolin alcohols.

Properties: Anhydrous; pale-straw color; nearly odorless, low-viscosity liquid. Miscible with ethanol, mineral oil, and other common formulating materials; insoluble in water. Combustible.

Use: Hydrophobic penetrant, emollient, plasticizer, cosolvent, pigment dispersant, cosmetics.

acetylacetanilide. See acetoacetanilide.

acetylacetic acid. See acetoacetic acid.

acetylacetonate. ((Z)-4-oxopent-2-en-2-olate). $C_5H_7O_2$. A chelate of acetylacetonate with any number of metals such as aluminum or beryllium.
Use: Extraction in organic solvents.

acetylacetonatobis(ethylene)rhodium(1).

Properties: Orange crystal; air stable. Soluble in chloroform and ether.

Use: Reactive ethylene complex.

acetylacetonatodicarbonylrhodium(1).

Properties: Green crystal grades (dichroic red when crushed); air stable. Soluble in acetone, benzene, and chlorinated solvents.

Use: Homogeneous catalyst for hydroformylation reactions.

acetylacetone. (diacetylmethane; pentanedione-2,4).

CAS: 123-54-6. $CH_3COCH_2OCCH_3$.

Properties: Mobile, colorless or yellowish liquid. When cooled, solidifies to lustrous, pearly spangles. The liquid is affected by light, turning brown and forming resins. Bp 140.5C; d 0.9753 (20/20C); bulk d 8.1 lb/gal; fp -23.5C; flash p 105F (40.5C) (TOC). Soluble in water (acidified by hydrochloric acid); fairly soluble in neutral water, alcohol, chloroform, ether, benzene, acetone, and glacial acetic acid. Combustible.

Derivation: By condensing ethyl acetate with acetone.

Hazard: Moderately toxic; moderate fire risk.

Use: Solvent for cellulose acetate, intermediate, chelating agent for metals, paint driers, lubricant additives, pesticides.

3-acetylacrolein. See 4-ketopental.

N-acetyl-L-(+)-alanine. See alanine.

acetylamino-. See acetamido-.

p-acetylaminobenzenesulfonyl chloride. See N-acetylsulfanilyl chloride.

o-acetylaminobenzoic acid. See acetylanthranilic acid.

p-acetylaminophenol. (APAP; N-acetyl-p-aminophenol; acetaminophen; p-acetamidophenol; p-hydroxyacetanilide).

CAS: 103-90-2. $CH_3CONHC_6H_4OH$.

Properties: Crystals; odorless; slightly bitter taste. D 1.293 (21/4C), mp 168C. Slightly soluble in water and ether; soluble in alcohol; pH saturated aqueous solution 5.5–6.5.

Derivation: Interaction of p-aminophenol and an aqueous solution of acetic anhydride.

Use: Intermediate for pharmaceuticals and azo dyes, stabilizer for hydrogen peroxide, photographic chemicals, medicine (analgesic).

p-acetylaminophenyl salicylate. (phenetsal). $C_6H_4(NHCOCH_3)OCC_6H_4OH$.

Properties: Fine, white, crystal scales; odorless; tasteless. Mp 187–188C. Soluble in alcohol, ether, and hot water; insoluble in light hydrocarbon solvents; decomposed by strong alkalis.

Derivation: By reducing p-nitrophenol salicylate to p-aminophenol salicylate and acetylating the latter.

Hazard: See aspirin.

Use: Medicine (analgesic).

p-acetylanisole. See p-methoxyacetophenone.

N-acetylanthranilic acid. (o-acetylaminobenzoic acid). $CH_3CONHC_6H_4COOH$.

Properties: Needles, plates, rhombic crystals (from glacial acetic acid). Mp 185C. Slightly soluble in water; soluble in hot alcohol, ether, and benzene. Combustible.

Derivation: Oxidation of o-acetyltoluidine with potassium permanganate in the presence of magnesium sulfate or potassium chloride.

Grade: Technical.

Use: Chemical (organic synthesis, anthranilic acid).

acetylase. (acetyltransacetylase; acetyltransferase; transacetylase). Any enzyme that catalyzes acetylation or deacetylation and also reverses the reaction.

acetylated monoglycerides.

Properties: Esters of glycerin with acetic acid and edible fat-forming fatty acids. (FCC III) May be white to pale yellow liquids or solids; bland taste. Sol in alc, acetone; insol in water.

Use: Food additive.

acetylation. Introduction of an acetyl radical ($\text{CH}_3\text{CO}-$) into the molecule of an organic compound having OH or NH_2 groups. The usual reagents for this purpose are acetic anhydride or acetyl chloride. Thus, ethanol ($\text{C}_2\text{H}_5\text{OH}$) may be converted to ethyl acetate ($\text{C}_2\text{H}_5\text{OCOCH}_3$). Cellulose is similarly converted to cellulose acetate by treatment with a mix containing acetic anhydride. Acetylation is commonly used to determine the number of hydroxyl groups in fats and oils. See acetyl value.

acetylbenzene. See acetophenone.

acetylbenzoyl aconine. See aconitine.

acetylbenzoyl peroxide. (acetozone; benzozone).

CAS: 644-31-5. $\text{C}_6\text{H}_5\text{CO}\cdot\text{O}_2\cdot\text{OCCH}_3$.

Properties: White crystals. Decomposed by water, alkaloids, organic matter, and some organic solvents; decomposes slowly and evaporates when gently heated, and instantaneously (possibly explosively) if quickly heated, ground, or compressed. Mp 36.6C; bp 130C (19 mm). Moderately soluble in ether, chloroform, carbon tetrachloride, and water; slightly soluble in mineral oils and alcohol. The commercial product is mixed with a neutral drying powder and contains 50% acetyl benzoyl peroxide.

Hazard: Toxic by ingestion. Strong irritant to skin and mucus membranes. Strong oxidizing agent; dangerous in contact with organic materials. Moderate explosion risk when shocked or heated.

Use: Medicine (active germicide); disinfectant; bleaching flour.

acetyl bromide.

CAS: 506-96-7. CH_3COBr .

Properties: Colorless, fuming liquid; turns yellow in air. Bp 81C; mp -96C; d 1.663 (16/4C). Soluble in ether, chloroform and benzene.

Derivation: Interaction of acetic acid and phosphorus pentabromide.

Grade: Technical.

Hazard: Toxic by ingestion and inhalation; strong irritant to eyes and skin. Reacts violently with water or alcohol.

Use: Organic synthesis, dye manufacture.

α -acetylbutyrolactone. (α -acetobutyrolactone).

$\text{CH}_2\text{CH}_2\text{CH}(\text{OCCH}_3)\text{C}(\text{O})\text{O}$.

Properties: Liquid; ester-like odor. D 1.18-1.19 (20C), bp 142-144 (30 mm). Partially soluble in water. Combustible.

Derivation: Sodium acetoacetate and ethylene oxide in absolute alcohol.

Hazard: Strong irritant to skin and mucus membranes.

Use: Organic synthesis.

acetyl carbinol. See hydroxy-2-propanone.

acetyl carbromal. (*N*-acetyl-*N*-bromodiethylacetylurea). $(\text{C}_2\text{H}_5)_2\text{CBrCONHCONHCOCH}_3$.

Properties: Crystals; slightly bitter taste. Mp 109C. Slightly soluble in water; freely soluble in alcohol and ethyl acetate.

Hazard: Overdoses may be fatal.

Use: Medicine (sedative).

acetyl chloride. (ethanoyl chloride).

CAS: 75-36-5. CH_3COCl .

Properties: Colorless, highly refractive, fuming liquid; strong odor. D 1.1051, mp -112C, bp 51-52C, flash p 40F (4.4C) (CC). Soluble in ether, acetone, acetic acid.

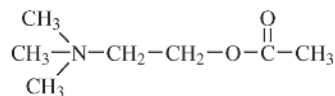
Derivation: By mixing glacial acetic acid and phosphorus trichloride in the cold and heating a short time to drive off hydrochloric acid. The acetyl chloride is then distilled.

Hazard: Corrosive to skin and mucous membranes; toxic; strong eye irritant. Flammable, dangerous fire risk. Reacts violently with water and alcohol.

Use: Organic preparations (acetylating agent); dyestuffs; pharmaceuticals.

acetylcholine. (acetyethanoltrimethylammonium hydroxide).

CAS: 51-84-3.



A derivative of choline; important because it acts as the chemical transmitter of nerve impulses in the autonomic system. It has been isolated and identified in brain tissue. The enzyme cholinesterase hydrolyzes acetylcholine into choline and acetic acid, and is necessary in the body to prevent acetylcholine poisoning.

Use: Medicine (as bromide and chloride); biochemical research.

See nerve gas; cholinesterase inhibitor.

acetylcholine chloride. (2-(acetyloxy)-*N,N,N*-trimethylethanaminium chloride; 2-acetyloxyethyl(trimethyl)azaniumchloride).

CAS: 60-31-1. $\text{C}_7\text{H}_{16}\text{NO}_2\cdot\text{Cl}$. A neurotransmitter found at neuromuscular junctions, autonomic ganglia, parasympathetic effector junctions, a subset of sympathetic effector junctions and at many sites in the central nervous system.

Properties: Deliquescent crystalline powder; miotic agent; cholinergic drug.

Hazard: Toxic.

acetylcholinesterase. See cholinesterase.

ACETYLCHOLINESTERASE INHIBITOR 14

acetylcholinesterase inhibitor. (anticholinesterase). A drug that blocks acetylcholinesterase, thereby increasing levels of acetylcholine in the synapse.

acetylcholinesterase reactivation. Acetylcholinesterase inhibition is spontaneously reversible by hydrolysis that removes the carbamylating or phosphorylating moiety from the enzyme.

acetyl-CoA acetyltransferase. (acetoacetyl-CoA thiolase; acetyl-CoA thiolase). An acetyltransferase that produces acetoacetyl-CoA from two molecules of acetyl-CoA with the release of one CoA.

acetyl-CoA hydrolase. (acetyl-CoA acylase; acetylCoA deacylase). An enzyme that catalyzes the splitting of acetate from acetyl-CoA.

acetyl-CoA synthetase. A long-chain fatty acid-CoA ligase that catalyzes the formation of acyl-CoA.

acetylcoenzyme A. (acetyl CoA; active acetate).

CAS: 72-89-9. A high-energy ester of acetic acid that plays important roles in the tricarboxylic acid cycle in fatty acid biosynthesis, and participates in many metabolic acetylation reactions.

Derivation: It is a condensation product of coenzyme a and acetic acid that results mainly from the metabolism of glucose and fatty acids in the mitochondria resulting in the release of acetyl groups that combine with the thiol group of coenzyme a.

n-acetylcysteine conjugate. (mercapturic acid; (2R)-2-acetamido-3-sulfanylpropanoic acid; *n*-acetyl-L-cysteine; acetoin; acetylcysteine, *n*-acetylcysteine; airbron; broncholyisin; flumucetin; flumucil; flumicil; inspir; mucolyicum; mucolyticum lappe; mucomyst; mucosolvine; nac; nac-tb; parvolex; respaire). $C_5H_9NO_3S$. Any of a class of compounds that are terminal receptors in the detoxication of potentially harmful electrophiles. It is the *N*-acetyl derivative of cysteine. It has been shown to have antiviral effects in patients with HIV due to inhibition of viral stimulation by reactive oxygen intermediates.

Properties: Crystals from water.

Use: As a mucolytic agent to reduce the viscosity of mucous secretions.

***N*-acetyl-L-cysteine (USAN).** $HSCH_2CH(NHCOCH_3)COOH$. The *N*-acetyl derivative of the naturally occurring amino acid, L-cysteine.

Use: Medicine, biochemical research.

α -acetyldigoxin (anhydrous). $C_{43}H_{66}O_{14}$.

Properties: Crystals. Sparingly soluble in water, ether, petroleum ether; soluble in most organic solvents.

Derivation: Obtained by enzymatic hydrolysis of a digitalis extract.

Hazard: Toxic.

Use: Medicine (heart disease).

acetyldigoxin. (Lantailin, Desglucolanatoside C, 3''-Acetyldigoxin, alpha-acetyldigoxin, sandolanid, Lanadigin, Digorid A, Acetyl-digoxin-alpha). $C_{43}H_{66}O_{15}$. Alpha- or beta-acetyl derivatives of digoxin or lanatoside C from *Digitalis lanata*.

Use: In congestive heart failure.

3-acetyl-2,5-dimethylfuran.

CAS: 10599-70-9. $C_8H_{10}O_2$.

Properties: Yellow liquid; strong roasted nutlike odor. D: 1.027–1.048, refr index: 1.475–1.496 (25 degree Celsius). Sol in alc, propylene glycol, fixed oils; sltly sol in water.

Use: Food additive.

acetyl dipterex. See chloracetophos.

acetylene. (ethene).

CAS: 74-86-2. $HC\equiv CH$.

Properties: Colorless gas; ethereal odor. D 0.91 (air = 1), mp $-81.8C$ (890 mm); bp $-84C$, flash p OF ($-17.7C$) (CC), autoign temp 635F (335C). Soluble in alcohol and acetone; slightly soluble in water. An asphyxiant gas.

Derivation: (a) By the action of water on calcium carbide; (b) by cracking petroleum hydrocarbons with steam (Wulff process), or natural gas by partial oxidation (BASF process); (c) from fuel oil by modified arc process.

Grade: Technical, containing 98% acetylene and not more than 0.05% by volume of phosphine or hydrogen sulfide; 99.5%.

Hazard: Very flammable, dangerous fire risk; burns with intensely hot flame; explosive limits in air 2.5–80%. A asphyxiate. Forms explosive compounds with silver, mercury, and copper, which should be excluded from contact with acetylene in transmission systems. Copper alloys may be used with caution. Piping used should be electrically bonded and grounded.

Use: Manufacture of vinyl chloride; vinylidene chloride; vinyl acetate; acrylates; acrylonitrile; acetaldehyde; per- and trichloroethylene; cyclooctatetraene; 1,4-butanediol; carbon black; and welding and cutting metals.

10-acetyldithranol.

CAS: 117568-24-8. $C_{16}H_{12}O_5$.

Hazard: A poison. A skin irritant.

acetylene black. The carbon black resulting from incomplete combustion of or thermal decomposition of acetylene.

Properties: High liquid adsorption, retention of high bulk volume, high electrical conductivity.

Use: Dry cell batteries, component of explosives, reinforcing agent in rubber and in thermal and sound

insulation, gloss suppressor in paints, carburizing agent in hardening of steel, pigment in printing inks, filler in electroconductive polymers.
See carbon black.

(acetylenecarbonyloxy)triphenyltin. See triphenyltin propiolate.

acetylene dichloride. See *sym*-dichloroethylene.

acetylene hydrocarbon. (alkyne). One of a class of unsaturated hydrocarbons of the homologous series having the generic formula C_nH_{2n-2} and a structural formula containing a triple bond.

acetylene polymer. See polyacetylene; 1,3,5,7-cyclooctatetraene.

acetylene tetrabromide. (*sym*-tetrabromethane).

CAS: 79-27-6. $CHBr_2CHBr_2$.

Properties: Yellowish liquid. D 2.98–3.00, bp 239–242C with decomposition, 151C (54 mm), mp 0.1C, refr index 1.638. Soluble in alcohol and ether, insoluble in water. Combustible.

Derivation: Interaction of acetylene and bromine and subsequent distillation.

Method of purification: Rectification.

Grade: Technical.

Hazard: Irritant by inhalation and ingestion. TLV: 1 ppm.

Use: Separating minerals by specific gravity; solvent for fats, oils, and waxes; fluid in liquid gauges; solvent in microscopy.

acetylene tetrachloride. See *sym*-tetrachloroethane.

acetylenogen. Calcium carbide.

***N*-acetylethanolamine.** (hydroxyethylacetamide). $CH_3CONHC_2H_4OH$.

Properties: Brown, viscous liquid. D 1.122 (20/20C); boiling range 150–152C (5 mm); decomposes (10 mm); bulk d 9.34 lb/gal; refr index 1.4730 (20C); flash p 350F (176.6C); fp 15.8C. Soluble in alcohol, ether, and water. Combustible.

Grade: Technical (75% solution in water).

Use: Plasticizer for polyvinyl alcohol and for cellulosic and proteinaceous materials; humectant for paper products, glues, cork, and inks; textile conditioner.

acetylethanoltrimethylammonium hydroxide. See acetylcholine.

acetylethyltetramethyltetralin. (1,1,4,4-tetra-methyl-6-ethyl-7-acetyl-1,2,3,4-tetrahydronaphthalene; polycyclic musk; musk tetralin; aett; 1-(3-ethyl-5,5,8,8-tetramethyl-6,7-dihydronaphthalen-2-yl)ethanone).

CAS: 88-29-9. $C_{18}H_{26}O$. An organic compound.

Properties: White crystals.

Hazard: Very toxic; neurotoxic.

Use: Formerly in perfumes.

acetylferrocene. (ferrocenyl methyl ketone). $C_5H_5FeC_5H_4COCH_3$.

Properties: Orange crystals. Mp 85–86C.

Use: Intermediate.

See ferrocene.

acetylformic acid. See pyruvic acid.

***n*-acetylglutamate.** ((2*S*)-2-acetamidopentanedioic acid; (2*S*)-2-acetamidoglutaric acid). $C_7H_{11}NO_5$. An amino acid that activates carbamyl phosphate synthetase during urea synthesis. This amino acid causes a configurational change in the enzyme, therefore increasing its affinity for adenosine triphosphate.

6-acetyl-grayanotoxin i. See grayanotoxin iii 6,14-diacetate.

acetylde. A salt-like carbide formed by the reaction of acetylene and an alkali or alkaline-earth metal in liquid ammonia, or with silver, copper, and mercury salts in aqueous solution. The latter are explosive when shocked or heated.
See carbide; calcium carbide.

acetyl iodide.

CAS: 507-02-8. CH_3COI .

Properties: Colorless, transparent, fuming liquid; suffocating odor; turns brown on exposure to air or moisture. D 1.98; bp 105–108C; refr index 1.55. Soluble in ether and benzene; decomposed by water and alcohol.

Derivation: Reaction of acetic acid, iodine, and phosphorus; reaction of acetyl chloride and hydrogen iodide.

Method of purification: Distillation.

Grade: Technical.

Hazard: Strong irritant to eyes and skin.

Use: Organic synthesis.

acetylisoeugenol. (isoeugenol acetate). $C_6H_3(CHCHCH_3)(OCH_3)(OCOCH_3)$.

Properties: White crystals; spicy, clove-like odor. Congealing point 77C, soluble in 27 parts of 95% alcohol. Combustible.

Method of purification: Crystallization.

Grade: Technical.

Use: Perfumery, particularly for carnation-type odors; flavoring.

acetyl ketene. See diketene.

***n*-acetylloline.**

CAS: 4914-36-7. $C_{10}H_{16}N_2O_2$.

Hazard: A poison.

Source: Natural product.

ACETYLMETHIONINE

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acetylmethionine. See *n*-acetyl-*l*-methionine.

***n*-acetyl-*l*-methionine.**CAS: 65-82-7. $C_7H_{13}NO_3S$.

Properties: Colorless or white crystals or powder; odorless. Sol in water, alc, alkali and mineral acids; insol in ether.

Hazard: A poison.

Use: Food additive; drug.

acetylmethylcarbinol. (acetoin; 3-hydroxy-2-butanone; dimethylketol).

CAS: 513-86-0. $CH_3COCH_2OCH_3$.

Properties: Slightly yellow liquid or crystals (dimer), oxidizes gradually to diacetyl on exposure to air. D 1.016, bp 140–148C, mp 15C. Soluble in alcohol; miscible with water; slightly soluble in ether. Combustible.

Derivation: Reduction of diacetyl.

Grade: Technical, FCC (as acetoin).

Use: Aroma carrier; preparation of flavors and essences.

acetyl nitrate. CH_3COONO_2 .

Properties: Colorless, fuming liquid. Hygroscopic. D 1.24.

Derivation: Reaction of acetic anhydride and nitrogen pentoxide.

Hazard: Corrosive to skin and mucous membranes. Explodes above 55C (130F) or in presence of mercuric oxide.

Use: Nitrating agent for organic compounds.

acetylnitro peroxide. (Pan; peroxyacetyl nitrate, 2-benzofuran-1,3-dione). $C_8H_4O_3$. An organic peroxide.

acetyl oxide. See acetic anhydride.

10-(acetyloxy)-1,8-dihydroxy-9(10h)-anthracenone. See 10-acetyldithranol.

4(or 6)-(acetyloxy)-5(or 4)-hexenoic acid.

CAS: 83145-58-8. $C_8H_{12}O_4$.

Hazard: Moderately toxic by ingestion and skin contact. A mild skin and severe eye irritant.

***o*-(4-(1-((acetyloxy)imino)ethyl)-3-methylphenyl) *o,o*-diethylphosphorothioate.**

CAS: 22936-44-3. $C_{15}H_{22}NO_5PS$.

Hazard: Moderately toxic by ingestion.

Use: Agricultural chemical.

acetyl peroxide. (diacetyl peroxide).

CAS: 110-22-5. $(CH_3CO)_2O_2$.

Properties: Colorless crystals. Mp 30C. Slightly soluble in cold water; soluble in alcohol and ether, flash p 113 (45C) (OC), fp approx –8C, d 1.18 (20C). Combustible.

Available forms: A 25% solution in dimethyl phthalate.

Hazard: (25% solution) Moderate fire risk; strong irritant to skin and eyes. The pure material is a strong oxidizer and severe explosion hazard; should not be stored after preparation, nor heated above 30C.

Use: Initiator and catalyst for resins.

acetylphenetidin. See acetophenetidin.

acetylphenol. See phenyl acetate.

***N*-acetyl-*p*-phenylenediamine.** See *p*-aminooacetanilide.

acetyl phosphate. (acetic phosphoric anhydride; phosphono acetate).

CAS: 590-54-5. $C_2H_3O_5P$. A high-energy phosphate that acts as an acetate donor in the metabolism of various bacteria.

acetylpropionic acid. See levulinic acid.

acetyl propionyl. (2,3-pentanedione; methyl ethyl glyoxal; methyl ethyl diketone).

CAS: 600-14-6. $CH_3COCOCH_2CH_3$.

Properties: Yellow liquid. Mp –52C, bp 106–110C, d 0.955–0.959 (15/4C). Partly soluble in water.

Combustible.

Grade: 99%.

Use: Flavors of butterscotch and chocolate type.

2-acetyl pyrazine.

CAS: 22047-25-2. $C_6H_6N_2O$.

Properties: Colorless to pale-yellow crystals or liquid; sweet popcorn-like odor. Mp: 75–78C, d: 1.100–1.115 @ 20C, refr index: 1.530–1.540 @ 25C. Sol in acids, alc, ether, and water @ 230C.

Hazard: A skin and eye irritant.

Use: Food additive.

2-acetylpyrrole.

CAS: 1072-83-9. C_6H_7NO .

Properties: Light beige to yellow crystals from petroleum ether; bread-like odor. Mp: 90C, bp: 220C. Sol in acids, alc, ether, water @ 230C.

Use: Food additive.

4-acetylresorcinol. (2,4-dihydroxyacetophenone). $C_6H_3(OH)_2COCH_3$.

Properties: Light tan crystals. Mp 146–148C. High absorptivity in UV region. Slightly soluble in water; soluble in most organic solvents except benzene and chloroform.

Use: UV absorber in plastics; dye intermediate; fungicide; plant growth promoter.

acetylsalicylate. (2-acetyloxybenzoic acid). $C_9H_8O_4$. A prototypical analgesic that has anti-inflammatory and antipyretic properties and acts as an inhibitor of cyclooxygenase which results in the inhibition of the biosynthesis of prostaglandins.

Properties: Salt, colorless crystals; melting point: 143C; slightly soluble in water.

Use: In the treatment of mild to moderate pain; in the prevention of arterial and venous thrombosis.

acetylsalicylic acid. See aspirin.

***N*-acetylsulfanilyl chloride.** (*p*-acetamidobenzenesulfonyl chloride; *p*-acetylaminobenzenesulfonyl chloride). (CH₃CONH)C₆H₄(SO₂Cl).

Properties: Light tan to brownish powder or fine crystals. Mp 149C. Soluble in chloroform and ethylene dichloride.

Hazard: Irritant to skin and mucous membranes.

Use: Intermediate in the manufacture of sulfa drugs.

2-(acetylthioglycolic amide)benzothiazole.

CAS: 63123-39-7. C₁₁H₁₀N₂O₂S₂.

Hazard: A poison by ingestion.

2-acetylthiophene. (methyl-2-thienyl ketone). CH₃COC₄H₃S.

Properties: Yellowish, oily liquid. Mp 10–11C, bp 213.5C, 88–90C (10 mm). Very slightly soluble in ether.

Use: Organic intermediate.

acetyl-*o*-toluidine. (*o*-acetotoluidide).

CH₃CONHC₆H₄CH₃.

Properties: Colorless crystals. Mp 110C, bp 296C, d 1.168 (15C). Soluble in alcohol, ether, benzene, chloroform, glacial acetic acid; slightly soluble in cold water; insoluble in hot water.

Derivation: By boiling glacial acetic acid with *o*-toluidine and distilling the product.

Grade: Technical.

Use: Organic synthesis.

acetyl-*p*-toluidine. (*p*-acetotoluidide).

CH₃CONHC₆H₄CH₃.

Properties: Colorless needles. Mp 153C, bp 307C, d 1.212 (15/4C). Slightly soluble in water; soluble in alcohol, ether, ethyl acetate, glacial acetic acid.

Grade: Technical.

Use: Dyes.

***n*-acetyltransferase.** A cytosolic enzyme isolated from rat liver, kidney, or certain other organs that catalyses the acetylation of xenobiotic amines.

acetyl triallyl citrate. CH₃COOC₃H₄(COOCH₂CH:CH₂)₃.

Properties: Liquid. Boiling range 142–143C (0.2 mm), d 1.140 (20C), refr index 1.4665 (25C), flash p 365F (185C). Combustible.

Use: Cross-linking agent for polyesters; monomer for polymerization.

acetyl tributyl citrate. CH₃COOC₃H₄(COOC₄H₉)₃.

Properties: Colorless, odorless liquid. Distillation range 172–174C (1 mm), pour p –60C, d 1.046 (25C), bulk d 8.74 lb/gal (25C), refr index 1.4408 (25C), viscosity 42.7 cP (25C), flash p 400F (204C). Insoluble in water. Combustible.

Derivation: Esterification and acetylation of citric acid.

Grade: Technical.

Use: Plasticizer for vinyl resins.

See “Citroflex A-4” [Vertellus].

acetyl triethyl citrate. CH₃COOC₃H₄(COOC₂H₅)₃.

Properties: Colorless liquid; odorless. Distillation range 131–132C (1 mm), pour p –47C, d 1.135 (25C), bulk d 9.47 lb/gal (25C), refr index 1.4386 (25C), viscosity 53.7 cP (25C), flash p 370F (187C). Slightly soluble in water. Combustible.

Derivation: Esterification and acetylation of citric acid.

Grade: Technical.

Use: Plasticizer for cellulose, particularly ethyl cellulose.

See “Citroflex A-2” [Vertellus]; ATEC.

acetyl tri-2-ethylhexyl citrate. CH₃COOC₃H₄(COOC₈H₁₇)₃.

Properties: Liquid. Bp 225C (1 mm), flash p 430F (222C). Insoluble in water. Combustible.

Grade: Technical.

Use: Low-volatility plasticizer for vinyl resins.

acetyltri-*n*-hexyl citrate. See “Citroflex A-6” [Vertellus].

***N*-acetyltryptophan.** Available commercially as *N*-acetyl-*l*-tryptophan, mp 185–186C; *N*-acetyl-*dl*-tryptophan, mp 205C.

Use: Nutrition and biochemical research; medicine.

acetyl valeryl. (heptadione-2,3). CH₃COOC₄H₉.

Properties: Yellow liquid. Combustible.

Grade: 92% pure.

Use: Cheese, butter, and miscellaneous flavors.

acetyl value. The number of milligrams of potassium hydroxide required for neutralization of acetic acid obtained by the saponification of 1 g of acetylated fat or oil sample. Acetylation is carried out by boiling the sample with an equal amount of acetic anhydride, washing, and drying. Saponification values on acetylated and on untreated fat are determined. From the results the acetyl value is calculated. It is a measure of the number of free hydroxyl groups in the fat or oil.

ACGIH. See American Conference of Governmental Industrial Hygienists.

achroglobin. A colorless respiratory protein compound found in certain invertebrate animals.

“ACHROMYCIN”

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“**Achromycin**” [*Heritage*]. TM for tetracycline hydrochloride.

achrodextrin. (achrodextrin). A low molecular weight dextrin produced during the digestion of starch by amylase.

acicular. Used to describe needle-shaped crystals or the particles in powders.

acid. One of a large class of chemical substances whose water solutions have one or more of the following characteristics: sour taste, ability to make litmus dye turn red and to cause other indicator dyes to change to characteristic colors, ability to react with and dissolve certain metals to form salts, and ability to react with bases or alkalis to form salts. All acids contain hydrogen. In water, ionization or splitting of the molecule occurs so that some or most of this hydrogen forms H_3O^+ ions (hydronium ions), usually written more simply as H^+ (hydrogen ion). Acids are referred to as strong or weak according to the concentration of H^+ ion that results from ionization. Hydrochloric, nitric, and sulfuric are strong or highly ionized acids; acetic acid (CH_3COOH) and carbonic acid (H_2CO_3) are weak acids. Tenth normal hydrochloric acid is 100 times as acid ($pH = 1$) as tenth normal acetic acid ($pH = 3$). The pH range of acids is from 6.9 to 1.

See pH . When dealing with chemical reactions in solvents other than water, it is sometimes convenient to define an acid as a substance that ionizes to give the positive ion of the solvent. The common definitions of acid have been extended as more detailed studies of chemical reactions have been made. The Lowry-Brønsted definition of an acid as a substance that can give up a proton is more useful in connection with an understanding of bases (see base). Perhaps the most significant contribution to the theory of acids was the electron-pair concept introduced by G. N. Lewis around 1915.

See Lewis electron theory. The terms *hard* and *soft* acids and bases refer to the ease with which the electron orbitals can be disturbed or distorted. Hard acids have a high positive oxidation state, and their valence electrons are not readily excited; soft acids and bases have little or no positive charge and easily excited valence electrons. Hard acids combine preferentially with hard bases, and soft acids with soft bases. Soft acids tend to accept electrons and form covalent bonds more readily than hard acids. For example, the halogen acids arranged in a series by increasing atomic weight (and decreasing chemical activity) show a progression from hard (HF) to soft (HI).

A brief outline of the major groups of acids is as follows:

Inorganic

Mineral acids: sulfuric, nitric, hydrochloric, phosphoric.

Hazard: All mineral acids are highly irritant and corrosive to human tissue.

Organic

Carboxylic (contain $-COOH$ group)

aliphatic: acetic, formic

aromatic: benzoic, salicylic

Dicarboxylic (contain two $-COOH$ groups)

oxalic, phthalic, sebacic, adipic

Fatty acids (contain $-COOH$ group)

aliphatic: oleic, palmitic, stearic

aromatic: phenylstearic

Amino acids: N-containing protein components

See Lewis acid; carboxylic acid; fatty acid; amino acid; specific compounds.

1,2,4-acid. (1-amino-2-naphthol-4-sulfonic acid). $C_{10}H_5NH_2OHSO_3H$.

Properties: Pinkish-white to gray needles. Soluble in hot water; but almost insoluble in cold water.

Derivation: β -naphthol is nitrated to nitroso- β -naphthol by reaction with nitrous acid and the product treated with sodium bisulfite. Upon acidification the free sulfurous acid effects simultaneous reduction and sulfonation.

Use: Aniline dye intermediate.

1,8,2,4-acid. See Chicago acid.

acid aerosol. An aerosol that contains high concentrations of acidic substances that can irritate the lungs and other soft tissues.

acid alcohol. Ethanol that contains 1% hydrochloric acid.

acid amide. See amide.

acid ammonium sulfate. See ammonium bisulfate.

acid ammonium tartrate. See ammonium bitartrate.

acid anhydride. An oxide of a nonmetallic element or of an organic radical that is capable of forming an acid when united with water, or which can be formed by the abstraction of water from the acid molecule, or can unite with basic oxides to form salts.

acid anthraquinone brilliant blue. See C.I. acid blue 80.

AcidAway. A system to neutralize air conditioning and refrigeration systems that have experienced burnout.

Acid Black 2.

Use: Hair color, reagent, biological stain.

acid butyl phosphate. See *n*-butyl acid phosphate.

acid calcium phosphate. See calcium phosphate, monobasic.

acid chrome orange gr. See C.I. mordant orange 6, disodium salt.

acid cleaner. A cleaner whose action depends on the presence of caustic minerals.

acid deposition. Acidic air pollutants (chiefly nitrogen oxides and sulfur oxides) deposited in the biogeosphere. These materials may be deposited as dry particulates or acidic gases or in rain, snow or fog.

acid dye. An azo, triarylmethane, or anthraquinone dye with acid substituents such as nitro-, carboxy-, or sulfonic acid. These dyes are most frequently applied in acid soluble to wool and silk, and no doubt combine with the basic groups of the proteins of those animal fibers. Orange II (CI 15,510), black 10B, and acid alizarin blue B are examples.

acid ethylsulfate. See ethylsulfuric acid.

acid ester. A derivative of a polyvalent organic acid in which some of the acid H atoms are replaced by a radical.

acid ester sulfate. (sulfuric acid ester). An ester sulfate in which one of the hydrogen atoms is replaced by a hydrocarbon. They are synthesized in phase II metabolic reactions releasing water-soluble products of xenobiotic compounds that are readily eliminated from the body.

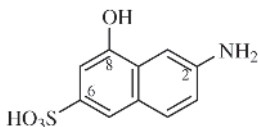
Use: Industrial alkylating agent.

acid fungal protease. (fungal protease enzyme).

Properties: Highly off-white powder.

Use: As a replacement for pepsin; chill-proofing agent for beer; in cereal treatment; feed supplement for baby pigs; rennet extender.

γ -acid. (2-amino-8-naphthol-6-sulfonic acid; aminonaphtholsulfonic acid-2,8,6).



Properties: White crystals. Soluble in alcohol and ether; slightly soluble in water.

Derivation: β -naphthylamine sulfate is sulfonated with 66% oleum; the precipitate, 2-naphthylamine-6,8-disulfonic acid, is heated with 65% sodium hydroxide solution at 210C and 210 psi.

Use: Azo dye intermediate.

acid glaucine blue. See peacock blue.

α -acid glycoprotein. (acute-phase reaction protein; orosomucoid; AAG). An anionic polymorphic conjugated protein that is chiefly hepatic in origin. The carbohydrate moiety, made up of equal parts of hexosamine, hexose, and sialic acid, comprises 45% of the molecule. Plasma levels may rise during chronic inflammation or conditions of acute physiological stress; levels may fall as a consequence of severe hepatic damage, certain serious gastroenteropathies, and severe malnutrition. It combines electrostatically with many basic xenobiotics.

acid halide. A compound that contains a carbonyl group bound to a halogen atom.

acid, hard. See Lewis electron theory; acid.

acid hydrogen. The hydrogen of the carboxyl group in organic compounds that can be displaced by metals, alkyls, aryls, or basic radicals.

acid hydrolyzed proteins.

Properties: Liquid, paste or powder. Sol in water.

Use: Food additive.

acidic amino acid. An amino acid that bears a net negative charge at neutral pH, that contain a second acid moiety and are hydrophilic.

acidic oxide. An oxide of a nonmetal, e.g., SO₂, CO₂, P₂O₅, SO₃, that forms an acid when combined with water.

See acid anhydride.

acidic salt. A salt that contains an ionizable hydrogen atom but does not necessarily produce acidic solutions.

acidimetry. The determination of the concentration of acid solutions or of the quantity of acid in a sample or mixture. This is usually done by titration with a solution of base of known strength (standard solution); an indicator is used to establish the end point.

See pH.

acid lining. Silica brick lining used in steel-making furnaces.

acid magnesium citrate. See magnesium citrate, dibasic.

acid magnesium phosphate. See magnesium phosphate, monobasic.

acid methyl sulfate. See methylsulfuric acid.

acid mine drainage. (AMD). Water from both active and inactive coal mines that has become contaminated with sulfuric acid as a result of hydrolysis of ferric sulfate, the oxidation product of pyrite.

ACID MINE WATER

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This is a factor in water and stream pollution, which can be corrected by use of appropriate ion-exchange resins.

acid mine water. Acidic water in pyritic coal mines due to the presence of free sulfuric acid and acidic sulfates, especially ferrous sulfate, leached from iron pyrites.

acid number. (acid value). Determined by the number of milligrams of potassium hydroxide required for the neutralization of free fatty acids present in 1 g of fat or oil. Also the measure of free acids present in a substance.

acidolysin. See glycoprotease.

acidolysis. A chemical reaction that is comparable to hydrolysis or alcoholysis, in which water or alcohol is used in place of the acid. It involves the decomposition of a molecule with the addition of the elements of an acid to the molecule.

acidophil. (acidophile). An organism that grows and lives successfully in acidic environments.

acidophil granule. (oxyphil granule). A granule that stains with an acid dye such as eosin.

acidosis. A condition in which blood pH decreases, either for metabolic or respiratory reasons.

acid phosphatase. An enzyme found in blood serum that catalyzes the liberation of inorganic phosphate from phosphate esters. Optimum pH 5; it is less active than alkaline phosphatase.

Use: Biochemical research.

acid phosphate. An acid salt of phosphoric acid such as NaH_2PO_4 , CaHPO_4 . Also used to refer specifically to calcium phosphate monobasic, $\text{Ca}(\text{H}_2\text{PO}_4)_2$, or superphosphate of lime.

acid potassium oxalate. See potassium binoxalate.

acid potassium sulfate. See potassium bisulfate.

acid precipitation. (acid rain). Any form of precipitation (wet deposition) having a pH of 5.6 or less, the most important deleterious components being the sulfur dioxide and oxides of nitrogen, either emitted as stack gases in highly industrialized areas or resulting from volcanic activity. The most sensitive sections of the U.S. are the East and the extreme Northwest; southeastern Canada is also affected. Acid precipitation is not only destructive to fish and other freshwater life, but also kills certain species of trees (especially spruce) and corrodes metal and cement structures. Industrial use of coal

is largely responsible for the incidence of acid rain, especially in the Northeast.

See dry deposition.

acid rain. See acid precipitation.

acid salt. A type of compound derived from an acid or a base in which only part of the hydrogen of the acid is replaced by a basic radical.

acid, soft. See Lewis electron theory; acid.

acid soil. Soil that has a pH value of less than 6.6.

acidulant. Any of a number of acids (chiefly organic) either occurring naturally in fruits and vegetables or used as additives in food processing. They function in the following ways: (1) as bacteriostats in processed foods; (2) as aids to the sterilization of canned foods by lowering the pH; (3) as chelating agents for metal ions such as iron and copper, which catalyze rancidity reactions in fats; (4) as flavor enhancers by offsetting excessive sweetness by their tart taste. Commonly used acidulants are citric, acetic, fumaric, ascorbic, propionic, lactic, adipic, malic, sorbic, and tartaric acids.

Acidulin. Glutamic acid hydrochloride acid value. The number of milligrams of potassium hydroxide required to neutralize the free acids present in 1 g of oil, fat, or wax. The determination is made by titrating the sample in hot 95% ethanol using phenolphthalein as indicator.

acid value. See acid number.

Acid Yellow 9. See 4-aminoazobenzene-3,4'-disulfonic acid.

acifluorfen, sodium salt. (Blazer).

Use: Postemergent herbicide for soybeans, peanuts, and rice.

“ACL 60” [Occidental]. TM for a product line of chlorinated isocyanurates that are an effective economical disinfectant, germicide, and algicide.

Use: Sanitizing swimming pools and spas.

Aclar. A series of fluorohalocarbon films.

Properties: Useful properties from -200 to $+198\text{C}$.

Use: In packaging applications where a transparent, vapor, and/or gas barrier is required, as in packaging of foods for astronauts. Used in electronic and electrical applications because of insulating and heat-resistant properties. Extreme chemical resistance and ability to seal make it useful as a tank lining, etc.

A-C-M. A balanced mixture of ascorbic acid (vitamin C) and citric acid.

Use: As an antioxidant that protects flavor and prevents browning of fruits exposed to air. Used in home freezing and canning of fresh fruits.

Acofor. A pale, distilled tall oil fatty acids.

Properties: D 0.907 (25/25C), refr index 1.471 (20C), flash p 380F (193C) (OC), acid number 192, saponification number 194, unsaponifiable matter 2.5%, rosin acids 4.5%. Combustible.

Use: Paint and varnish, inks, soaps, disinfectants, textile oils, core oils, etc.

Aconew. A pale, distilled tall oil fatty acids with low rosin acid contents.

aconine. C₂₅H₄₁NO₉.

Properties: Amorphous shaped, monobasic, diterpoid alkaloid solid; molecular weight: 499.6.

Heazard: Poison.

aconitase. (citrate (isocitrate) hydrolyase; aconitate hydratase). The enzyme that catalyzes the reversible interconversion of citric acid, *cis*-aconitic acid, and isocitric acid in the tricarboxylic acid cycle. It is the target of fluoroacetate, a powerful rodenticide that condenses with oxaloacetate to produce an aconitase inhibitor.

aconite. (monkshood; wolfsbane; friar's cowl).

Hazard: Antipyretic drug, alkaloid poison.

aconitic acid. (propene-1,2,3-tricarboxylic acid). H(COOH)C:C(COOH)CH₂(COOH).

Properties: White to yellowish, crystalline solid. Mp approx 195C (decomposes). Soluble in water and alcohol. Combustible.

Derivation: (a) By dehydration of citric acid with sulfuric acid; (b) extraction from sugar cane bagasse, *Aconitum napellus*, and other natural sources.

Use: Preparation of plasticizers and wetting agents; antioxidant; organic syntheses; itaconic acid manufacture; synthetic flavors.

aconitine. (acetyl benzoyl aconine).

CAS: 302-27-2. C₃₄H₄₉NO₁₁.

Hazard: Highly toxic alkaloid, antipyretic drug, readily absorbed by skin.

Aconitum. (aconite; friar's cowl; monkshood; wolfsbane; wolf's bane). A genus of more than 100 species of poisonous North temperature zone flowering plants of the family Ranunculaceae, some of which are violently poisonous.

acp-acetyltransferase. (acetyl transacylase).

An enzyme that initiates fatty acid biosynthesis by transferring an acetyl moiety from acetyl-CoA to acp.

acp-malonyltransferase. (malonyl transacylase). An enzyme that transfers malonyl from malonyl-CoA to acp; a key step in the biosynthesis of fatty acids.

acridine dye. Any of a class of polycyclic compounds derived from acridine, that are important

as fluorochromes in cytochemistry, histology, and chemotherapy.

acrosin. A serine proteinase that is active in spermatozoa.

acrylylcholine. A choline ester toxin produced by the gastropod mollusk, *Buccinum undatum*. It has an action similar to that of muscarine and nicotine.

Hazards: cardiotoxic; hypotensive; stimulates gastric motility and secretion; increases respiration.

acquired genetic mutation. See somatic cell genetic mutation.

acquired mutations. See somatic cell genetic mutation.

"Acrafix" [Lanxess]. TM for a processing chemical for high-quality pigment prints.

acraldehyde. See acrolein.

"Acrawax" [Lonza]. TM for *N,N'*-ethylenebisstearamide.

CAS: 110-30-5.

Grade: Atomized powdered, prilled, and beaded grades.

Use: In plastics and metal powder lubricants, varnishes, lacquers, defoamers, and mar-resistant antiblock paints.

Acree's reaction. A test for protein in which a violet ring appears when concentrated sulfuric acid is introduced below a mixture of the unknown solution and a formaldehyde solution containing a trace of ferric oxide.

acridine orange. (*N,N,N',N'*-tetramethyl-3,6-acridinediamine monohydrochloride).

CAS: 494-38-2. C₁₇H₁₉N₃•HCl.

Hazard: An in vitro mutagen. Questionable carcinogen.

Use: Selective biological stain for tumor cells, *intravital*; causes retardation of tumor growth.

acridine (tricyclic).

CAS: 260-94-6. C₁₃H₉N.

Properties: Small, colorless needles. Sublimes at 100C, mp 111C, bp above 360C. Soluble in alcohol, ether, or carbon disulfide; sparingly soluble in hot water.

Derivation: (a) By extraction with dilute sulfuric acid from the anthracene fraction from coal tar and adding potassium dichromate. The acridine chromate precipitated is recrystallized, treated with ammonia, and recrystallized. (b) Synthetically.

Hazard: Strong skin irritant.

Use: Manufacture of dyes; derivatives, especially acriflavine, proflavine; analytical reagent.

2-(1-(9-ACRIDINYL)HYDRAZINO)ETHANOL 22

2-(1-(9-acridinyl)hydrazino)ethanol monohydrochloride.

CAS: 28846-44-8. $C_{15}H_{15}N_3O \cdot ClH$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

4-(9-acridinyl)-2-methyl-3-thiosemicarbazide.

CAS: 28846-37-9. $C_{15}H_{14}N_4S$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

4-(9-acridinyl)-2-methyl-3-thiosemicarbazone acetone.

CAS: 29023-85-6. $C_{18}H_{18}N_4S$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

4-(9-acridinyl)-3-thiosemicarbazide.

CAS: 29023-84-5. $C_{14}H_{12}N_4S$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

acriflavine. $C_{14}H_{14}N_3Cl$. A mixture of 3,6-diamino-10-methylacridinium chloride and 3,6-diaminoacridine.

Properties: Brownish or orange, odorless, granular powder. Soluble in three parts of water; incompletely soluble in alcohol; nearly insoluble in ether and chloroform. The aqueous solutions fluoresce green on dilution. Also available as the hydrochloride.

Use: Antiseptic and bacteriostat.

“Acrilan” [Solutia]. TM for an acrylic fiber.

acrinathrin. See 2,2-dimethyl-3-(3-oxo-3-(2,2,2-trifluoro-1-(trifluoromethyl)).

acroleic acid. See acrylic acid.

acrolein. (2-propenal; acrylaldehyde; allyl aldehyde; acraldehyde).

CAS: 107-02-8. CH_2CHCHO .



Properties: Colorless or yellowish liquid; disagreeable, choking odor. Bp 52.7C, mp -87.0C, d 0.8427 (20/20C), bulk d 7.03 lb/gal (20C). Flash p below 0F (-17C) (COC), autoign temp 532F (277C). Soluble in water, alcohol, and ether. Polymerizes readily unless inhibitor (hydroquinone) is added. Very reactive.

Derivation: (1) Oxidation of allyl alcohol or propylene; (2) by heating glycerol with magnesium sulfate; (3) from propylene with bismuth-phosphorus-molybdenum catalyst.

Method of purification: Rectification.

Grade: Technical.

Hazard: Very irritating to eyes and skin. Toxic by inhalation and ingestion. Upper respiratory tract irritant, pulmonary edema, and pulmonary emphysema. Questionable carcinogen. Dangerous fire risk. Explosive limits in air 2.8–31%.

Use: Intermediate for synthetic glycerol, polyurethane and polyester resins, methionine, pharmaceuticals; herbicide; warning agent in gases.

acrolein dimer. (2-formyl-3,4-dihydro-2H-pyran).



Properties: Liquid. D 1.0775 (20C), bp 151.3C, fp -100C, flash p 118F (47.7C) (OC), bulk d 8.96 lb/gal (20/20C). Soluble in water. Combustible.

Hazard: Moderate fire risk.

Use: Intermediate for resins, pharmaceuticals, dyestuffs.

acrolein test. A test for the presence of glycerine or fats. A sample is heated with potassium bisulfate. Acrolein is released for a positive test.

“Acronal” [BASF]. TM for dispersions, solutions, and solids of acrylate homo- and copolymers.

ACR process. Abbreviation for advanced cracking reactor. See ethylene.

acrylaldehyde. See acrolein.

acrylamide.

CAS: 79-06-1. $CH_2CHCONH_2$.

Properties: Colorless, odorless crystals. Mp 84.5C, bp 125C (25 mm), d 1.122 (30C). Soluble in water, alcohol, acetone; insoluble in benzene, heptane. The solid is stable at room temperature but may polymerize violently on melting.

Derivation: Reaction of acrylonitrile with sulfuric acid (84.5%) and neutralization.

Grade: Technical (approximately 97% pure).

Hazard: Toxic by skin absorption. Present in particulate and vapor phases. Irritant to skin and mucous membranes. Central nervous system impairment. Probable carcinogen.

Use: Synthesis of dyes, etc., cross-linking agent, adhesives, paper and textile sizes, soil-conditioning agents, flocculants, sewage and waste treatment, ore processing, permanent-press fabrics.

acrylamide gels. A polymer gel used for electrophoresis of DNA or protein to measure their sizes (in daltons for proteins, or in base pairs for DNA). See “Gel Electrophoresis”. Acrylamide gels are especially useful for high resolution separations of DNA in the range of tens to hundreds of nucleotides in length.

***p*-acrylamidobenzoic acid (diethylamino)ethyl ester.** See procaine acryloyl monomer.

2-acrylamido-2-methyl-1-propanesulfonic acid.

CAS: 15214-89-8. C₇H₁₃NO₂S.

Hazard: Low toxicity by ingestion.

acrylate. (1) Any of the several monomers used for the manufacture of thermosetting acrylic surface coating resins, e.g., 2-hydroxyethyl acrylate (HEA) and hydroxypropyl acrylate (HPA). (2) Polymer of acrylic acid or its esters, used in surface coatings, emulsion paints, paper and leather finishes, etc.

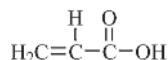
See acrylic acid; acrylic resin.

acrylate-acrylamide resins.

Use: Food additive.

acrylic acid. (acroleic acid; propenoic acid).

CAS: 79-10-7. H₂C:CHCOOH.



Properties: Colorless liquid; acid odor. Bp 140.9C, mp 12.1C, d 1.052 (20/20C), vap press 3.1 mm (20C), bulk d 8.6 lb/gal (20C), refr index 1.4224 (20C). Flash p 130F (54.5C) (OC). Polymerizes readily. Miscible with water, alcohol, and ether. Combustible.

Derivation: (1) Condensation of ethylene oxide with hydrocyanic acid followed by reaction with sulfuric acid at 320F; (2) acetylene, carbon monoxide, and water, with nickel catalyst; (3) propylene is vapor oxidized to acrolein, which is oxidized to acrylic acid at 300C with molybdenum-vanadium catalyst; (4) hydrolysis of acrylonitrile.

Grade: Technical (esterification and polymerization grades), glacial (97%).

Hazard: Irritant and corrosive to skin. Toxic by inhalation. May polymerize explosively. Upper respiratory tract irritant. Questionable carcinogen.

Use: Monomer for polyacrylic and polymethacrylic acids and other acrylic polymers.

See acrylic resin.

acrylic fiber. A manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% (by weight) acrylonitrile units -CH₂CH(CN)- (U.S. Federal Trade Commission).

Properties: Tensile strength 2-3 g/denier, water absorption 1.5-2.5%, d approx 1.17. Combustible.

Hazard: Fumes are toxic.

Use: Modacrylic fibers; blankets; carpets.

See modacrylic fiber; acrylic resin.

acrylic polymers. See acrylic resin.

acrylic resin. (acrylic fiber; nitrile rubber). Thermoplastic polymers or copolymers of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile. The monomers are colorless liquids that polymerize readily in the presence of light, heat, or catalysts such as benzoyl peroxide; they must be stored or shipped with inhibitors present to avoid spontaneous and explosive polymerization.

Properties: Acrylic resins vary from hard, brittle solids to fibrous, elastomeric structures to viscous liquids, depending on the monomer used and the method of polymerization. A distinctive property of cast sheet and extruded rods of acrylic resin is ability to transmit light.

Use: Bulk-polymerized: hard, shatterproof, transparent or colored material (glass substitute, decorative illuminated signs, contact lenses, dentures, medical instruments, specimen preservation, furniture components). Suspension-polymerized: beads and molding powders (headlight lenses, adsorbents in chromatography, ion-exchange resins). Solution polymers: coatings for paper, textiles, wood, etc. Aqueous emulsions: adhesives, laminated structures, fabric coatings, nonwoven fabrics. Compounded prepolymers: exterior auto paints, applied by spray and baked. Acrylonitrile-derived acrylics are extruded into synthetic fibers and are also the basis of the nitrile family of synthetic elastomers.

See acrylic acid; acrylonitrile; methyl methacrylate.

Acryloid coating resins. Acrylic ester polymers in organic solvent solutions or 100% solid forms; water-white and transparent. Films range from very hard to very soft.

Use: Exceptionally resistant surface coatings, such as heat-resistant and fumeproof enamels; vinyl and plastic printing; fluorescent coatings; clear and pigmented coatings on metals.

Acryloid Modifiers. Thermoplastic acrylic polymers in powder form. Various grades facilitate processing or improve physical properties of rigid or semi-rigid polyvinyl chloride formulations.

Acryloid oil additives. Acrylic polymers supplied in special oil solution or in diester lubricant.

Use: Viscosity-index improvement, pour-point depression of lubricating oils and hydraulic fluids, sludge dispersancy in lubricating and fuel oils.

“Acrylon” [Stromdahl]. TM for a group of acrylic rubbers outstanding in resistance to oil, grease, ozone, and oxidation.

Hazard: Central nervous system impairment, and lower respiratory tract irritant.

Use: Gaskets and rubber parts for contact with oils and diester lubricants.

acrylonitrile. (propenenitrile; vinyl cyanide).

CAS: 107-13-1. H₂C:CHCN.

Properties: Colorless, mobile liquid; mild odor. Fp -83C; bp 77.3-77.4C, d 0.8004 (25C), flash p 32F

ACRYLONITRILE-BUTADIENE RUBBER 24

(OC) (TOC). Soluble in all common organic solvents; partially miscible with water.

Derivation: (1) From propylene oxygen and ammonia with either bismuth phosphomolybdate or a uranium-based compound as catalysts; (2) addition of hydrogen cyanide to acetylene with cuprous chloride catalyst; (3) dehydration of ethylene cyanohydrin.

Hazard: Toxic by inhalation and skin absorption. A possible carcinogen. Flammable, dangerous fire risk. Explosive limits in air 3–17%.

Use: Monomer for acrylic and modacrylic fibers and high-strength whiskers; ABS and acrylonitrile styrene copolymers; nitrile rubber; cyanoethylation of cotton; synthetic soil blocks (acrylonitrile polymerized in wood pulp); organic synthesis; adiponitrile; grain fumigant; monomer for a semi-conductive polymer that can be used like inorganic oxide catalysts in dehydrogenation of *tert*-butanol to isobutylene and water.

acrylonitrile-butadiene rubber. See nitrile rubber.

acrylonitrile-butadiene-styrene resin. Most contemporary ABS resins are true graft polymers consisting of an elastomeric polybutadiene or rubber phase, grafted with styrene and acrylonitrile monomers for compatibility, dispersed in a rigid styrene-acrylonitrile (SAN) matrix. Mechanical polyblends of elastomeric and rigid copolymers, e.g., butadiene-acrylonitrile rubber and SAN, historically the first ABS resins, are also marketed. Varying the composition of the polymer by changing the ratios of the three monomers and use of other comonomers and additives results in ABS resins with a wide range of properties.

Properties: Dimensional stability over temperature range from –40 to +71°C. Attacked by nitric and sulfuric acids and by aldehydes, ketones, esters, and chlorinated hydrocarbons. Insoluble in alcohols, aliphatic hydrocarbons, and mineral and vegetable oils. Processed by conventional molding and extrusion methods. D 1.04; tensile strength about 6500 psi, flexural strength 10,000 psi, good electrical resistance, water absorption 0.3–0.4%. Combustible but slow-burning; flame retardants may be added. Can be vacuum-metallized or electroplated.

Grade: High-, medium-, and low-impact; molding and extrusion.

Use: Engineering plastics used for automobile body parts and fittings; telephones; bottles; heels; luggage; packaging; refrigerator door liners; plastic pipe and building panels (subject to local building codes); shower stalls; boats; radiator grills; machinery housings; business machines.

Note: Several trademarked types are “Cycolac” [Sabic], Abson, “Lustran” [INEOS ABS].

See ABS resin.

acrylonitrile dimer. See methylene glutaronitrile.

acrylonitrile-styrene copolymer. A thermoplastic blend of acrylonitrile and styrene monomers having good dimensional stability and suitable for use in contact with foods. Among its numerous applications is that of bottles for soft drinks (Cycle-safe).

Hazard: FDA regulations limit to 0.3 ppm the amount of acrylonitrile monomer that will be allowed to migrate from the container to the contents.

acryloyl chloride. (acryloyl chloride). $\text{H}_2\text{CCHCOCl}$.

Properties: Liquid. Bp 75°C.

Use: Monomer, intermediate.

“Acrysol” [Lawson]. (1) TM for aqueous solutions of sodium polyacrylate or other polymeric acrylic salts. (2) TM for polyacrylic acid and copolymer products in aqueous solutions or dispersions. Some grades are solutions of sodium polyacrylate.

Use: (1) Thickeners in paints, fabric coatings and backings, adhesives. (2) Warp size for synthetic fibers, cotton and rayon, modifier of starch sizes.

ACS. See American Chemical Society; American Carbon Society.

ACTH. (adrenocorticotrophic hormone; corticotropin).

CAS: 9002-60-2. One of the hormones secreted by the anterior lobe of the pituitary gland. It stimulates an increase in the secretion of the adrenal cortical steroid hormones. It is a polypeptide consisting of a 39-unit chain of amino acids, the sequence varying in certain positions with the biological species. ACTH was synthesized in 1960.

Properties: White powder with molecular weight approximately 3500. Freely soluble in water; soluble in 60–70% alcohol or acetone. Solutions are stable to heat.

Source: Extracted from whole pituitary glands of swine, sheep, and oxen. Normally isolated from swine.

Grade: Pure; USP as corticotropin injections.

Units: Based on comparison with USP Corticotropin Reference Standard.

Hazard: May have damaging side effects.

Use: Medicine; biochemical research.

“Acti-Brom” [Nalco]. TM for chemical program used to control microbiological deposits.

Use: In cooling water systems.

Acti-dione. Antibiotic cycloheximide, an agricultural fungicide.

“Actimoist” [Active]. (hyaluronic acid).

CAS: 9067-32-7. TM for active natural mucopolysaccharide.

Properties: Clear, colorless, viscous liquid.

Use: To help maintain long-lasting moisture balance on the skin.

actin. A protein making up the thin filaments of muscle and cytoskeleton of eukaryotic cells.

actinide series. (actinoid series). The group of radioactive elements starting with actinium and ending with element 105. All are classed as metals. Those with atomic number higher than 92 are called transuranic elements. The series includes the following elements: actinium, 89; thorium, 90; protactinium, 91; uranium, 92; neptunium, 93; plutonium, 94; americium, 95; curium, 96; berkelium, 97; californium, 98; einsteinium, 99; fermium, 100; mendelevium, 101; nobelium, 102; and lawrencium 103. The isotopes of several of these elements are under study for possible use in such fields as radiography, neutron activation analysis, hydrology, and geophysics.

actinium. Ac. A radioactive metallic element; first member of the actinide series. Similar to lanthanum.

Properties: Atomic number 89, aw 227 (most stable isotope), silvery white metal. Mp 1050C, bp (est) 3200C, oxidation state +3. Eleven radioactive isotopes; 227 has half-life of 21.8 years.

Derivation: Uranium ores; neutron bombardment of radium. Several compounds have been prepared. Available commercially at 98% minimum purity.

Hazard: Radioactive bone-seeking poison.

Use: Radioactive tracer (225 isotope). See lanthanum.

actinohematin. A red respiratory pigment found in certain sea anemones of the genus *Actinia*.

actinolite. A greenish crystalline or fibrous variety of asbestos.

actinomycin. A family of antibiotics produced by Streptomyces; reported to be active against *Escherichia coli*, other bacteria and fungi to have cytostatic and radiomimetic activity. There are many forms of actinomycin; two of commercial importance are dactinomycin and dactinomycin.

actinomycin D. (2-amino-4,6-dimethyl-3-oxo-1-N,9-N-bis[7,11,14-trimethyl-2,5,9,12,15-pentaoxo-3,10-di(propan-2-yl)-8-oxa-1,4,11,14-tetrazabicyclo[14.3.0]nonadecan-6-yl]phenoxazine-1,9-dicarboxamide; act; actinomycindioic d acid; dilactone; actinomycin I; AD; cosmegen; dactinomycin; dilactone actinomycindioic d acid; HBF 386; lyovac cosmegen; meractinomycin; NCI-C04682; NSC-3053; oncostatin k).

CAS: 50-76-0. $C_{62}H_{86}N_{12}O_{16}$. It binds to DNA and inhibits RNA synthesis (transcription, with chain elongation more sensitive than initiation, termination, or release. As a result of impaired mRNA

production, protein synthesis also declines after dactinomycin therapy.

Properties: Composed of two cyclic peptides attached to a phenoxazine.

Derivation: from Streptomyces parvullus.

Hazard: Poison; questionable carcinogen; neoplas-tigen; teratogen; tumorigen.

actinon. Rn. An isotope of radon that has a half-life of about 4 seconds. It is a member of the noble gas family found in soil and is released during the decay of radium.

Actitex. An activated carbon fiber.

Available forms: Rolls.

Use: Removal of pesticides from drinking water and VOCs from process gases.

activated alumina. See alumina, activated.

activated carbon. See carbon, activated.

activated sludge. See sewage sludge (2).

activation. The process of treating a substance or a molecule or atom by heat or radiation or the presence of another substance so that the first-mentioned substance, atom, or molecule will undergo chemical or physical change more rapidly or completely. Common types of activation are: (1) Processing of carbon black, alumina, and other materials to impart improved adsorbent qualities. Subjecting the material to steam or carbon dioxide at high temperatures is the method usually used.

See alumina, activated; carbon, activated. (2) Heating or otherwise supplying energy to a substance (e.g., ultraviolet or infrared radiation) to attain the necessary level of energy for the occurrence of a chemical reaction, or for emission of desired light waves, as in fluorescence or chemical lasers. The term *excitation* is also used. (3) An important variation of (2) is the process of making a material radioactive by bombardment with neutrons, protons, or other nuclear particles.

See activation analysis; energy, activation. (4) Catalytic processes in which the energy of activation for occurrence of a reaction is lowered by the presence of a nonreacting substance.

activation analysis. An extremely sensitive technique for identifying and measuring very small amounts of various elements. A sample is exposed to neutron bombardment in a nuclear reactor, for the purpose of producing radioisotopes from the stable elements. The characteristics of the induced radiations are sufficiently distinct that different elements in the sample can be accurately identified. The technique is particularly useful when concentration of the elements is too small to be measured by ordinary means. Trace elements have thus been determined in drugs, fertilizers, foods, fuels, glass, minerals, dusts, water, toxicants, etc.

ACTIVATION ENERGY

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activation energy. (1) Distinct energy states corresponding to minima of a potential energy surface in a configuration space. If tunneling is considered, lower energy paths become possible, but an activation energy can be associated with the reaction (at a given temperature) via the relationship between temperature and reaction rate. (2) The amount of energy (SI unit of joules) required to convert 1 mole of a reactant from the ground state to the transition state.

activator. (1) A metallic oxide that promotes cross-linking of sulfur in rubber vulcanization. By far the most widely used is zinc oxide; in rubber mixes where no organic accelerator is used, oxides of magnesium, calcium, or lead are effective. (2) A fatty acid that increases the effectiveness of acidic organic accelerators; stearic acid is generally used, especially with thiazoles. (3) A substance necessary in trace quantities to induce luminescence in certain crystals. Silver and copper are activators for zinc sulfide and cadmium sulfide.
See initiator.

active amyl alcohol. See 2-methyl-1-butanol.

active carbon. See carbon, activated.

active metabolite. A biologically active substance produced by, or modified by, a metabolic process from a precursor.

active metal. A highly reactive metal, usually one that occupies a place in the first or second column of the periodic table. A metal that forms cations by readily giving up electrons.

active oxygen. A highly reactive species of oxygen that destroy microsomal cytochromes by initiating autoxidation and are formed in the animal body by successive additions of an electron and a hydrogen ion to a molecule of molecular oxygen, yielding OH_2^- .

active pharmaceutical ingredient. (API). The biologically active compound in a drug formulation that imparts the desired therapeutic effect.

active site. The region of an enzyme that binds a substrate molecule and catalytically transforms it, usually a small portion of the total enzyme molecule.

active transport. Energy-requiring transport of a solute across a membrane in the direction of increasing concentration. Contrast with passive transport.

activin.

CAS: 114949-22-3.

Hazard: Moderately toxic by ingestion and skin contact. A moderate skin and mild eye irritant.

Source: Natural product.

activity. (1) Chemical activity (thermodynamic activity): a quantity replacing actual molar concentration in mathematical expressions for the equilibrium constant so as to eliminate the effect of concentration on equilibrium constant. (2) Activity coefficient: a fractional number which when multiplied by the molar concentration of a substance in solution yields the chemical activity. This term gives an idea of how much interaction exists between molecules at higher concentration. (3) Activity of metals or elements: an active element will react with a compound of a less active element to produce the latter as the free element, and the active element ends up in a new compound. Thus, magnesium, an active metal, will displace copper from copper sulfate to form magnesium sulfate and free metallic copper; chlorine will liberate iodine from sodium iodide and sodium chloride is formed. See electromotive series. (4) Activity product: the number resulting from the multiplication of the activities of slightly soluble substances. This is frequently called the solubility product. (5) Catalytic activity: see catalysis. (6) Optical activity: the existence of optical rotation in a substance. (7) Radioactivity activity coefficient. (8) Biology: The true thermodynamic activity of a substance, as distinct from its molar concentration. Most of the time we call the activity equal to the molar concentration and ignore it.
See activity (2).

activity series. (displacement series; electromotive series). An arrangement of the metals in the order of their tendency to react with water and acids, so that each metal displaces from solution those below it in the series and is displaced by those above it. The arrangement of the more common metals is: K Na Mg Al Zn Fe Sn Pb H Cu Hg Ag Pt Au.

Actol. A series of polyoxypropylene diols, triols, and polyols. These vary in molecular weight from approximately 1000 to 3600; the diols and triols are almost insoluble in water, but the polyols are completely miscible with it.

Use: Urethane foams, elastomers, and coatings.

Acumer 1000. An acrylic homopolymer.

Use: For water treatment, scale inhibitor, and as a dispersant.

“Acumist” [Honeywell]. TM for homopolymer, and copolymer polyolefin waxes.

Use: For adhesives, coatings, color concentrates, cosmetics, inks, lubricants, paints, plastics, rubber, and textiles.

acyl. An organic acid group in which the OH of the carboxyl group is replaced by some other substituent (RCO-). Examples: acetyl, $\text{CH}_3\text{CO}-$; benzoyl, $\text{C}_6\text{H}_5\text{CO}-$.

n-acylamino acid.

CAS: 9012-37-7. An amino acid in which the nitrogen is linked to an acyl group in attached.

acyl carrier protein. (ACP). Any of a class of proteins that bind acyl intermediates during the synthesis of long-chain fatty acids. ACPs are importantly involved in the biosynthesis of fatty acids.

acyl chloride. A compound in which a chlorine atom is bound to the carbon atom of a carbonyl group.

acyl halide. Any compound composed of an acyl group bonded to a halogen.

Properties: Highly reactive with strong nucleophiles; fuming, irritant substance.

Derivation: They are derived from a carboxylic acid by replacement of the hydroxyl group by a halogen.

acyloin. (3-hydroxyoctadecan-2-one).

$C_{18}H_{36}O_2$. A class of hydroxyl ketones.

Derivation: Produced by the condensation of aldehydes.

acyloxy radical. An oxygen-centered radical composed of an acyl radical bonded to an oxygen atom.

acyl phosphate. Any molecule with the general chemical form adenosine 3',5'-cyclic monophosphate.

ADA. Abbreviation for acetonedicarboxylic acid. See β -ketoglutaric acid.

1-adamantanamine hydrochloride. See amantadine hydrochloride.

adamantane. (*sym*-tricyclodecane). $C_{10}H_{16}$. Has unique molecular structure consisting of four fused cyclohexane rings.

Properties: White crystals. Mp 270C (sublimes), approximately 99% pure. Derivatives (alkyl adamantanes) have potential uses in imparting heat, solvent, and chemical resistance to many basic types of plastics. Synthetic lubricants and pharmaceuticals are also based on adamantane derivatives. Adamantane diamine is used to cure epoxy resins.

See "Symmetrel" [Upsher-Smith].

adamsite. See diphenylamine chloroarsine.

Adams, Roger. (1889–1971). An American chemist, born in Boston; graduated from Harvard, where he taught chemistry for some years. After studying in Germany, he moved to the University of Illinois in 1916, where he later became chairman of the department of chemistry (1926–1954). During his prolific career, he made this department one of the best in the country, and strongly influenced the development of industrial chemical research in the U.S. His executive and creative ability made him an outstanding figure as a teacher, innovator, and administrator. Among his research contributions were development of platinum-hydrogenation catalysts, and structural determinations of chaulmoogric acid, gossypol, alkaloids, and marijuana.

He held many important offices, including president of the ACS and AAAS, and was a recipient of the Priestley medal.

addition polymer. A polymer formed by the direct addition or combination of the monomer molecules with one another. An example is the formation of polystyrene by stepwise combination of styrene monomer units (approximately 1000 per macromolecule).
See polymerization.

additive. A nonspecific term applied to any substance added to a base material in low concentrations for a definite purpose. Additives can be divided into two groups: (1) those which have an auxiliary or secondary function (antioxidants, inhibitors, thickeners, plasticizers, flavoring agents, colorants, etc.); and (2) those that are essential to the existence of the end product (leavening agents in bread, curatives in rubber, blowing agents in cellular plastics, emulsifiers in mayonnaise, polymerization initiators in plastics, and tanning agents in leather). It seems logical that the latter group should be regarded less as additives than as base materials, since the end products could not exist without them. In any case, a specific functional name is preferable to the neutral term *additive*.

See food additive.

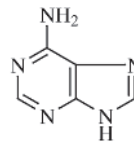
additive genetic effects. When the combined effects of alleles at different loci are equal to the sum of their individual effects.

See anticipation.

adduct. See inclusion complex.

adenase. (adenine deaminase). An enzyme in animals that catalyzes the hydrolysis of adenine to hypoxanthine.

adenine. (6-aminopurine).
CAS: 73-24-5. $C_5H_5N_5$.



Properties: White, odorless, microcrystalline powder; sharp salty taste. Mp 360–365C (decomposes). Very slightly soluble in cold water; soluble in boiling water, acids, and alkalis; slightly soluble in alcohol; insoluble in ether and chloroform. Aqueous solutions are neutral.

Occurrence: Ribonucleic acids and deoxyribonucleic acids, nucleosides, nucleotides, and many important coenzymes.

Derivation: By extraction from tea; by synthesis from uric acid; prepared from yeast ribonucleic acid.

Use: Medicine and biochemical research.

ADENOSINE

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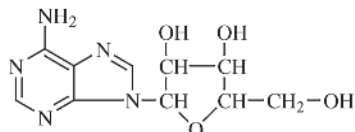
adenosine. (adenine riboside; 9- β -D-ribofuranosyl-adenine).

CAS: 58-61-7. $C_5H_4N_5 \cdot C_5H_8O_4$. The nucleoside composed of adenine and ribose.

Properties: White, crystalline, odorless powder; mild, saline, or bitter taste. Mp 229C. Quite soluble in hot water; practically insoluble in alcohol.

Derivation: Isolation following hydrolysis of yeast nucleic acid.

Use: Biochemical research.



adenosine diphosphate. (5'-adenylphosphoric acid; ADP; adenosine-5'-pyrophosphate; adenosine diphosphoric acid).

CAS: 58-64-0. $C_{10}H_{15}N_5O_{10}P_2$. A nucleotide found in all living cells and important in the storage of energy for chemical reactions.

Derivation: (1) From adenosine triphosphate by hydrolysis with the enzyme adenosinetriphosphatase from lobster or rabbit muscle; (2) by yeast phosphorylation of adenosine.

Use: Biochemical research.

Available forms: Sodium or barium salt of adenosinediphosphoric acid.

See adenosine diphosphate.

adenosine kinase. An enzyme catalyzes the transfer of phosphate groups from ATP to adenosine, producing adenosine diphosphate (ADP) and adenosine monophosphate (AMP).

adenosine monophosphate. See adenylic acid.

adenosine monophosphate deaminase. (adenylic acid deaminase; AMP deaminase). An enzyme that catalyzes the conversion of adenylic acid to inosinic acid.

adenosine phosphate (USAN). (5'-adenyldiphosphoric acid; ATP; adenosine triphosphate; adenosine 5'-(tetra-hydrogen triphosphate)).

CAS: 56-65-5. $C_{10}H_{16}N_5O_{13}P_3$. A nucleotide that serves as a source of energy for biochemical transformations in plants (photosynthesis) and also for many chemical reactions in the body, especially those associated with muscular activity and replication of cell components. Composed of the purine base, adenosine, and D-ribose attached to three phosphate groups, two of which are high-energy groups. It is an essential energy-storage and energy-transfer component of all living cells. Metabolic hydrolysis of ATP releases pyrophosphate (O_7P_2)

and large amounts of free energy forming adenosine diphosphate (ADP). The large amount of free energy released in this reaction train drives numerous endergonic metabolic processes.

Properties: White, amorphous powder; odorless; faint sour taste. Soluble in water; insoluble in alcohol, ether, and organic solvents; stable in acidic solutions; decomposes in alkaline solution.

Derivation: Isolation from muscle tissue; yeast phosphorylation of adenosine. ATP is reconstituted mainly during photosynthesis and oxidative phosphorylation from ADP.

Use: Biochemical research.

Available forms: Disodium, dipotassium, and dibarium salts.

adenylate cyclase. (adenyl cyclase, 3',5'-cyclic adenosine monophosphate synthetase). The enzyme that catalyzes the conversion of ATP to adenosine 3',5'-cyclic monophosphate (cyclic AMP). It is sometimes a site of toxicant action that can have grave consequences. The active site of this enzyme is part of a complex polymer that includes hormone or neurotransmitter receptors, and guanine nucleotide-binding proteins.

adenylic acid. (adenosine monophosphate). Any of a group of isomeric nucleotides that contains the adenylic radical, $C_5H_4N_5$.

3'-adenylic acid. (yeast adenylic acid). $C_{10}H_{14}N_5O_7P$.

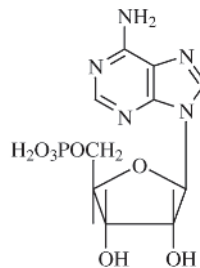
Properties: Crystals. Mp 197C (decomposes). Almost insoluble in cold water; slightly soluble in boiling water. Gives quantitative yield of furfural when distilled with 20% hydrochloric acid.

Derivation: Extracted from nucleic acids of yeast; also made synthetically.

Use: Biochemical research.

5'-adenylic acid. (adenosine monophosphate; AA; adenosine phosphate; AMP; adenosinephosphoric acid; cAMP).

CAS: 61-19-8. $C_{10}H_{14}N_5O_7P$. The monophosphoric ester of adenosine, i.e., the nucleotide containing adenine, *d*-ribose, and phosphoric acid. Adenylic acid is a constituent of many important coenzymes. Cyclic adenosine-3',5'-monophosphate is designated by biochemists as cAMP.



Properties: (Muscle adenylic acid) crystalline solid. Mp 196–200C. Readily soluble in boiling water. Gives only traces of furfural when boiled with 20% hydrochloric acid.

Derivation: Extracted from muscle tissue; phosphorylation of adenosine.

Use: Biochemical research.

adenylic acid deaminase. (AMP deaminase; adenosine monophosphate deaminase). An enzyme that catalyzes the conversion of adenylic acid to inosinic acid and NH_3 .

adenyl kinase. (adenylic acid kinase; myokinase). A phosphotransferase that catalyzes the phosphorylation of one molecule of ADP by another, yielding adenosine triphosphate (ATP) and adenosine monophosphate (AMP).

adhesion. The state in which two surfaces are held together by interfacial forces, which may consist of valence forces or interlocking action, or both (ASTM).

adhesion tension. The decrease in free surface energy that occurs when a unit liquid–solid interface is substituted for a unit air–solid interface. It is equal to the product of the surface tension of the liquid and the cosine of the liquid–solid angle of contact.

adhesive. Any substance, inorganic or organic, natural or synthetic, that is capable of bonding other substances together by surface attachment. A brief classification by type is as follows:

I. Inorganic

- (1) Soluble silicates (water glass)
- (2) Phosphate cements
- (3) Portland cement (calcium oxide-silica)
- (4) Other hydraulic cements (mortar, gypsum)
- (5) Ceramic (silica-boric acid)
- (6) Thermosetting powdered glasses (“Pyroceram”)

II. Organic

- (1) Natural:
 - (a) Animal: hide and bone glue, fish glue, blood and casein glues
 - (b) Vegetable: soybean starch cellulose, rubber latex, and rubber-solvent (pressure-sensitive); gums, terpene resins (rosin), mucilages
 - (c) Mineral asphalt, pitches, hydrocarbon resins
- (2) Synthetic
 - (a) Elastomer-solvent cements
 - (b) Polysulfide sealants
 - (c) Thermoplastic resins (for hot-melts): polyethylene, isobutylene, polyamides, polyvinyl acetate
 - (d) Thermosetting resins: epoxy, phenoformaldehyde, polyvinyl butyral, cyanoacrylates
 - (e) Silicone polymers and cements

For further information, refer to Case Western Reserve University in Cleveland, Ohio, which maintains a fundamental research center for adhesives and coatings.

adhesive, high-temperature. (1) An organic polymer, e.g., polybenzimidazoles, that retains bonding strength up to 260C for a relatively long time (500–1000 hours); strength drops rapidly above 260C, 80% being lost after 10 minutes at 535C. (2) An inorganic (ceramic), e.g., silica-boric acid mixtures or cermets produce bonds having high strength above 2000F. Adhesive lap-bond strengths can be over 2000 psi at 1000F. These adhesives are used largely for aerospace service, and for metal–metal and glass–metal seals. A silicone cement is reported to have been used to adhere tiles to spacecraft.

See RTV.

adhesive, hot-melt. A solid, thermoplastic material that melts quickly upon heating, and then sets to a firm bond on cooling. Most other types of adhesives set by evaporation of solvent. Hot-melt types offer the possibility of almost instantaneous bonding, making them well suited to automated operation. In general, they are low-cost, low-strength products, but are entirely adequate for bonding cellulosic materials. Ingredients of hot-melts are polyethylene, polyvinyl acetate, polyamides, hydrocarbon resins, as well as natural asphalts, bitumens, resinous materials, and waxes.

Use: Rapid and efficient bonding of low-strength materials, e.g., bookbinding, food cartons, sideseaming of cans, miscellaneous packaging applications.

See sealant.

adhesive, rubber-based. (cement, rubber). (1) A solution of natural or synthetic rubber in a suitable organic solvent, without sulfur or other curing agent; (2) a mixture of rubber (often reclaimed), filler, and tackifier (pine tar, liquid asphalt) applied to fabric backing (pressure-sensitive friction tape); (3) a room-temperature curing rubber-solvent-curable mixture, often made up in two parts that are blended just before use; (4) rubber latex, especially for on-the-job repairing of such items as conveyor belts; (5) silicone rubber cement (see RTV and silicone).

Hazard: Those containing organic solvents, (1) and (3) above, are flammable.

adhesive working life. (pot life). The length of time an adhesive is usable after being mixed.

adiabatic. Descriptive of a system or process in which no gain or loss of heat is allowed to occur.

adigoside.

CAS: 14259-51-9. $\text{C}_{35}\text{H}_{54}\text{O}_9$.

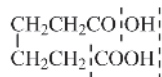
Hazard: A poison.

Source: Natural product.

ADIPIIC ACID

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adipic acid. (hexanedioic acid; 1,4-butanedicarboxylic acid).
CAS: 124-04-9.



Properties: White, crystalline solid. Mp 152C, bp 265C (100 mm), d 1.360 (20/4C), flash p 385F (196C) (CC). Slightly soluble in water; soluble in alcohol and acetone. Relatively stable. Combustible.

Derivation: Oxidation of cyclohexane, cyclohexanol, or cyclohexanone with air or nitric acid.

Grade: Technical; FCC.

Hazard: Upper respiratory tract and autonomic nervous system impairment.

Use: Manufacture of nylon and of polyurethane foams; preparation of esters for use as plasticizers and lubricants; food additive (acidulant); baking powders; adhesives.

adipocere. The grease material formed when animal fats decompose.

adipocyte. An animal cell specialized for the storage of triacylglycerols.

adiponitrile. (1,4-dicyanobutane).
CAS: 111-69-3. $\text{NC}(\text{CH}_2)_4\text{CN}$.

Properties: Water-white, odorless liquid. Mp 1–3C, refr index 1.4369 (20C), bp 295C, flash p 200F (93.3C) (OC). Slightly soluble in water, soluble in alcohol and chloroform. Combustible.

Derivation: Chlorination of butadiene to dichlorobutylene, which is reacted with 35% sodium cyanide soluble to yield 1,4-dicyanobutylene, which is hydrogenated to adiponitrile. Also by electroorganic synthesis from acrylonitrile.

Hazard: Toxic by ingestion and inhalation. Upper and lower respiratory tract irritant.

Use: Intermediate in the manufacture of nylon; organic synthesis.

Adipol. A series of adipate plasticizers.

adipose tissue. Connective tissue specialized for the storage of large amounts of triacylglycerols.

“Adiprene” [Chemtura]. TM for a polyurethane rubber, the reaction product of diisocyanate and polyalkylene ether glycol. In its raw polymer form, it is a liquid of honey-like color and consistency, which is compounded chemically (to polymerize it further) and converted into products by casting and other techniques. See polyurethane.

“Adiprene” [Uniroyal]. See “Vibrathane.”

adjuvant. A subsidiary ingredient or additive in a mixture (medicine, flavoring, perfume, etc.) which contributes to the effectiveness of the primary ingredient.

Adkins catalyst. A catalyst containing copper chromite and copper oxide. It is used for the reduction of organic compounds, usually at high temperatures and pressures. It is likewise used as a catalyst for dehydrogenation and for decarboxylation reactions.

Adkins–Peterson reaction. Formation of formaldehyde by air oxidation of methanol in the vapor phase over metal oxide catalysts. A 40% aqueous formaldehyde solution is obtained.

ADK STAB. A line of organic and inorganic industrial chemicals, synthetic resins, synthetic rubber, high-compound fertilizers, coating materials, latexes, pharmaceutical and food additives, explosives, photopolymers and platemaking systems, separation and ion-exchange membranes, systems, and equipment.

(-)-adlumidine. See *l*-capnoidine.

***d*-adlumidine.**

CAS: 550-49-2. $\text{C}_{20}\text{H}_{17}\text{NO}_6$.

Hazard: A poison.

Source: Natural product.

“ADMA” [Albemarle]. TM for a group of alkyldimethylamines composed of even-numbered carbon chains from C_8 to C_{18} .

ADME. The four steps a drug goes through when administered are absorption, dilution, metabolism, excretion.

admiralty metal. A nonferrous alloy containing 70–73% copper, 0.75–1.20% tin, remainder zinc.

Properties: Offers good resistance to dilute acids and alkalis, seawater, and moist sulfurous atmospheres. D 8.53 (20C), liquidus temp 935C, solidus temp 900C.

Use: Condenser, evaporator, and heat exchanger tubes, plates, and ferrules.

Admox. (lauryl dimethylamine oxide). A foam stabilizer and viscosity builder.

Use: In janitorial products.

adocain. A mixture of cocaine hydrochloride and adonidin (a glucoside from *Adonis vernalis*).

Use: Heart stimulant and diuretic.

“Adogen” [Evonik]. TM for primary fatty amines.

Use: Corrosion inhibitors and sludge dispersants for lube oil additives, textile intermediates, antistatic agents, down well corrosion inhibitors, and bactericides.

“Adogen” [Evonik]. TM for dialkyl dimethyl quaternaries.

Use: Paper debonders, dye retarders, organophilic clays, antistatic agents, car-wash rinse aids, sugar clarification, fabric softeners, creme rinses. A high performance cationic quaternary fabric softener for retail, industrial, laundry, textile, and paper softener applications.

“Adogen 442” [Evonik]. TM for ditallow dimethylammonium chloride, dihydrogenated.

Grade: 75% paste, 96% powder.

Use: High-performance cationic quaternary fabric softener for retail, industrial, laundry, textile, and paper softener applications.

adoMet. See S-adenosylmethionine.

adonidin. Any of the cardiotoxic phenanthrene glycosides that occur in various species of *Adonis*. Effects are similar to those of digitalin.

Hazard: Poison.

adonitoxin. (3-[96-deoxy- α -1-mannopyranosyl]-oxy}-14,16-dihydroxy-19-oxocard-20(22)-enolide).

$C_{29}H_{42}O_{10}$. A phenanthrene glycoside.

Derivation: Occurs in *Adonis vernalis*.

Hazard: Toxic.

ADP. Abbreviation for (1) adenosine diphosphate, (2) ammonium dihydrogen phosphate. See ammonium phosphate, monobasic.

adrenal cortex. The outer portion of the adrenal gland that secretes various steroid hormones. The outer region of the cortex *zona glomerulosa* produces mineralocorticoids and glucocorticoids; the inner region, the *zona reticularis-fasciculata* secretes mainly cortisol and certain other glucocorticoids.

adrenal gland. (adrenal body; suprarenal gland). Either of a pair of glandular, ductless glands in vertebrates. They are situated on or near the kidneys in mammals and are superior to the kidney in primates. Each is composed of an inner medulla that secretes adrenalin and noradrenalin, and an outer cortex that secretes steroid hormones (corticosteroids). In some vertebrates, the two types of adrenosecretory tissue form separate glands.

adrenaline. (epinephrine). $C_9H_{13}O_3N$. A hormone having a benzenoid structure. It is obtained by extraction from the adrenal glands of cattle and is also made synthetically. Its effect on body metabolism is pronounced, causing an increase in blood pressure and rate of heart beat. Under normal conditions, its rate of release into the system is constant; but emotional stresses such as fear or anger rapidly increase the output and result in temporarily heightened metabolic activity.

Hazard: Toxic by ingestion and injection.

adrenal medulla. The inner portion of the adrenal gland that secretes adrenalin and noradrenalin.

adrenergic antagonist B. A drug that competitively inhibits the binding of catecholamines to β -adrenergic receptors. They are used to decrease cardiovascular activity, improve blood circulation, and inhibit hypertension, cardiac arrhythmias, and angina.

Hazard: Bronchospasm; fatigue; hypoglycemia.

adrenocorticotropic hormone. See ACTH; corticoid hormone.

adrenodoxin. A ferredoxin involved in electron transfer from NADPH+ to cytochrome p-450. The process is catalyzed by a reductase in the adrenal gland.

Adripene. A synthetic resin.

Use: For soles of athletic footwear.

adsorbent. A substance that has the ability to condense or hold molecules of other substances on its surface. Activated carbon, activated alumina, and silica gel are examples.

adsorption. Adherence of the atoms, ions, or molecules of a gas or liquid to the surface of another substance, called the adsorbent. The best-known examples are gas–solid and liquid–solid systems. Finely divided or microporous materials presenting a large area of active surface are strong adsorbents and are used for removing colors, odors, and water vapor (activated carbon, activated alumina, silica gel). The attractive force of adsorption is relatively small, of the order of van der Waals forces. When molecules of two or more substances are present, those of one substance may be adsorbed more readily than those of the others. This is called preferential adsorption.

See absorption; chemisorption.

adsorption indicator. A substance used in analytical chemistry to detect the presence of a slight excess of another substance or ion in solution as the result of a color produced by adsorption of the indicator on a precipitate present in the solution. Thus, a precipitate of silver chloride will turn red in a solution containing even a minute excess of silver ion (silver nitrate solution) if fluorescein is present. In this example, fluorescein is the adsorption indicator.

Advacide. TPLA; a free-flowing powder of triphenyl lead acetate containing 10% of a liquid aromatic hydrocarbon mixture.

Use: Antifouling paints.

Advantage. A variety of polymers.

Use: Hair care resins.

ADVECTION

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advection. The transfer of air and its characteristics by horizontal motion.

aeolotropic. (eolotropic). Displaying change of physical properties with change of position or direction, as in the change of refractive index on changing position of double refracting crystals: not isotropic.

AEPD. Abbreviation for 2-amino-2-ethyl-1,3-propanediol.

aerate. To impregnate or saturate a material (usually a liquid) with air or some similar gas. This is usually achieved by bubbling the air through the liquid, or by spraying the liquid into air.

aerobe. An organism that uses oxygen as the terminal electron acceptor in respiration.

aerobic. Requiring or occurring in the presence of oxygen.
See bacteria.

aerobic dehydrogenase. An enzyme, usually a metalloflavoenzyme such as xanthine oxidase, that catalyzes the transfer of hydrogen from a substrate molecule to oxygen with the formation of hydrogen peroxide.

“Aero” [Cytec]. TM; used as a combining form in naming a group of chemical products, e.g., “Aero-float.” They include the following:

case-hardening mixtures	metal heat-treating salts
catalysts	metallurgical additives
fertilizer additives	anticaking agents
flotation agents	sizing emulsions
floculants	wetting agents
frothing/foaming agents	reinforcing agents

aerogel. Dispersion of a gas in a solid or a liquid: the reverse of an aerosol. Flexible and rigid plastic foams are examples.
See foam; aerosol.

aerosol. A suspension of liquid or solid particles in a gas, the particles often being in the colloidal size range. Fog and smoke are common examples of natural aerosols; fine sprays (perfumes, insecticides, inhalants, antiperspirants, paints, etc.) are manufactured.

aerosols. Suspensions of various kinds may be formed by placing the components together with a compressed gas in a container (bomb). The pressure of the gas causes the mixture to be released as a fine spray (aerosol) or foam (aerogel) when a valve is opened. This technique is used on an industrial scale to spray paints and pesticides. It is also used in consumer items such as perfumes, deodorants, shaving cream, whipped cream, and the like. The propellant gas may be a hydrocarbon

(propane, isobutane) or dimethyl ether. Admixture of 15% of methyl chloride with the hydrocarbons reduces their fire risk; for this purpose water can be used with dimethyl ether. Carbon dioxide generated in situ is a propellant which does away with the flammability problem.

“Aerothene” [Dow]. TM for a group of chlorinated solvents used as vapor pressure depressants, or with compressed gases to replace fluorocarbon propellant systems.

Aerothenet TT.

CAS: 71-55-6. 1,1,1-trichloroethane solvent.

Use: Leather and suede cleaning.

aerotolerant anaerobe. Any organism such as a bacterium that grows and reproduces under both aerobic and anaerobic conditions. Energy is obtained by fermentation regardless of ambient conditions.

aerozine. A 1:1 mix of hydrazine and *uns*-dimethylhydrazine (UDMH).

Hazard: Flammable and explosive.

Use: Rocket fuels.

See hydrazine.

aerugidiol.

CAS: 116425-35-5. C₁₅H₂₂O₃.

Hazard: A poison by ingestion.

AES. Abbreviation for Auger electron spectroscopy.

See spectroscopy.

AET. See β-aminoethylisothiourea dihydrobromide.

AFCF. See ferric ammonium ferrocyanide.

affected relative pair. Individuals related by blood, each of whom is affected with the same trait. Examples are affected sibling, cousin, and avuncular pairs.

See avuncular relationship.

affinin. (*N*-isobutyl-2,6,8-decatrienamide).

C₁₄H₂₃NO.

Properties: Yellowish, oily liquid. Bp 163C (0.5 mm), mp 23C, refr index 1.52. Soluble in alcohol; insoluble in alkalies and acids.

Derivation: From *Heliopsis longipes* or made synthetically.

Use: Insecticide activator.

affinity. The tendency of an atom or compound to react or combine with atoms or compounds of different chemical constitution. For example, paraffin hydrocarbons were so named because they are quite unreactive, the word *paraffin* meaning “very little affinity.” The hemoglobin molecule has a much greater affinity for carbon monoxide than

for oxygen. The free energy decrease is a quantitative measure of chemical affinity.

affinity constant. The reciprocal of the dissociation constant; a measure of the binding energy of a ligand in a receptor.

aflatoxins.

CAS: 1402-68-2. A group of polynuclear molds (mycotoxins) produced chiefly by the fungus *Aspergillus flavus*; they are natural contaminants of a wide range of fruits, vegetables, and cereal grains.

Hazard: Highly toxic to many species of animals, including fish and birds. The B₂ and G₁ strains are known carcinogens. Aflatoxins fluoresce strongly under UV, and are soluble in methanol, acetone, and chloroform, but only slightly soluble in water and hydrocarbon solvents. Prevention of mold growth is the most effective protection; removal or inactivation is possible by physical or chemical means (hand-sorting, solvent refining, etc.). Complete elimination of aflatoxins from foods is not feasible; FDA sets an upper limit of 20 ppb in foods and feeds, and 0.5 ppb in milk. Confirmed carcinogen.

See mycotoxin.

aflatoxin C₁₇H₁₂O₆. (2,3-6α,9α-tetrahydro-4-methoxycyclopenta-[c]-furo-[3*n*,2*n*:4,5]furo[2,3h][1]benzopyran-1,11-dione; aflatoxin b).

CAS: 1162-65-8. C₁₇H₁₂O₆.

Properties: Blue fluorescence; crystalline material.

Derivation: Secreted by *Aspergillus flavus* and *Aspergillus parasiticus*.

Hazard: Mycotoxin; liver poison; carcinogen; toxic; mutagen; tumorigen; neoplastigen; teratogen.

aflatoxin C₁₇H₁₄O₆. (2,3-6α,8,9,9α-tetrahydro-4-methoxycyclopenta-[c]-furo-[3*n*,2*n*:4,5]furo[2,3h][1]benzopyran-1,11-dione; dihydroaflatoxin B₁).

CAS: 7220-81-7. C₁₇H₁₄O₆. The 8,9-dihydro derivative of aflatoxin b₁.

Properties: Blue fluorescence; yellow crystals.

Hazard: Toxic; mutagen; carcinogen; tumorigen.

aflatoxin G₁. (3,4,7α,9,10,10α-tetrahydro-5-methoxy-1*h*,12*h*-furo-[3*n*,2*n*:4,5]-furo[2,3h]-pyrano[3,4-c][1]benzopyran-1,12-dione).

CAS: 1165-39-5. C₁₇H₁₂O₇.

Properties: Green fluorescence.

Derivation: Secreted by *Aspergillus parasiticus*.

Hazard: Mycotoxin; toxic; mutagen; carcinogen; neoplastigen.

aflatoxin C₁₇H₁₄O₇. (3,4,7α,9,10,10α-hexahydro-5-methoxy-1*h*,12*h*-furo-[3*n*,2*n*:4,5]-furo[2,3h]-pyrano[3,4-c][1]benzopyran-1,12-dione; dihydroaflatoxin G₁).

CAS: 7241-98-7. C₁₇H₁₄O₇. The 9,10-dihydro derivative of aflatoxin G₁.

Properties: Crystals with green fluorescence.

Derivation: Occur in foodstuffs contaminated with *Aspergillus flavus*.

Hazard: Toxic; mutagen; carcinogen.

aflatoxin C₁₇H₁₂O₇. (2,3,6α,9α-tetrahydro-9α-hydroxy-4-methoxycyclopenta[c]furo[2,3-h][1]benzopyran-1,11-dione; 4-hydroxyaflatoxin B₁).

CAS: 6795-23-9. C₁₇H₁₂O₇. The 4-hydroxylated derivative of aflatoxins B.

Properties: Crystals that exhibit blue-violet fluorescence.

Derivation: Occur in the milk of cattle that have been fed infested meal.

Hazard: Mutagen; carcinogen; extremely toxic (hepatotoxic).

aflatoxin M₂. (2,3,6α,8,9,9α-hexahydro-9α-hydroxy-4-methoxycyclopenta[c]furo[3*n*,2*n*:4,5]-furo[2,3h][1]benzopyran-1,11-dione). The 4-hydroxylated derivative of aflatoxins B.

Derivation: Occurs in the milk of cattle that have been fed infested meal.

Hazard: Mutagen; carcinogen; toxic.

afterblow. In the Bessemer process, continuing the blast air flow in order to remove phosphorus after the removal of carbon.

after-chromed dye. A dye that is improved in color or fastness by treatment with sodium dichromate, copper sulfate, or similar materials, after the fabrics are dyed.

after-coppering dye. A dye that is improved in color or fastness by treatment with copper sulfate, after the fabrics are dyed.

after cure. Continuing the process of vulcanizing after the cure has been carried to the proper degree and the heat is cut off.

afterdamp. Carbon monoxide.

Derivation: Produced in coal mines by methane explosions.

after-flow. The action of the plastic flow in solids continuing after external forces have stopped.

after-glow. (1) The remaining luminescence in rarefied gas after electrodeless charge has passed through. (2) The glow that remains after the extinguishing of a flame.

Ag. Symbol for silver.

aga. (potassium-6-amino-4-sulfonaphthalene-2-sulfonatehydrate). C₁₀H₁₀KNO₇S₂. A codon of arginine that directs the placement of arginine into a polypeptide.

agar. (agar-agar). A phycocolloid derived from red algae such as *Gelidium* and *Gracilaria*; it is a polysaccharide mixture of agarose and agarpectin.

AGAROSE

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Properties: Thin, translucent membranous pieces or pale buff powder. Strongly hydrophilic, it absorbs 20 times its weight of cold water with swelling; forms strong gels at approximately 40C.

Grade: Technical, USP, FCC.

Use: Microbiology and bacteriology (culture medium); antistaling agent in bakery products, confectionery, meats, and poultry; gelation agent in desserts and beverages; protective colloid in ice cream, pet foods, health foods, laxatives, pharmaceuticals, dental impressions, laboratory reagents, and photographic emulsions.

See algae; arginic acid.

agarose.

CAS: 9012-36-6.

Properties: A neutral, linear polymer composed of alternating residues of D-galactose and 3,6-anhydro-1-galactose.

Derivation: Extracted from seaweed.

Use: The resolving medium in electrophoresis.

agarose gels. A polysaccharide gel used to measure the size of nucleic acids (in bases or base pairs). See "Gel Electrophoresis". The gel of choice for DNA or RNA in the range of thousands of bases in length, or even up to 1 megabase when employing pulsed field gel electrophoresis.

agate-ware. An enameled iron or steel frequently used for kitchenware.

agc. ((2S,3R,4S,5S,6R)-6-(hydroxymethyl)oxane-2,3,4,5-tetrol). $C_6H_{12}O_6$. A codon of serine that directs the placement of serine into a polypeptide.

age hardening. The spontaneous hardening of alloys at room temperature within a of couple days after quenching as a result of grain structures.

agent blue. (dimethylarsinic acid; herbicide blue). $C_2H_7AsO_2$.

Properties: A solution of cacodylic acid (0.37 kg/l) that is an arsenical.

Use: Has been used as a dermatologic agent and a herbicide.

agent orange. A toxic herbicide and defoliant containing 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4-dichlorophenoxyacetic acid (2,4-D), with trace amounts of dioxin. Its use has been restricted.

agent purple. (herbicide purple).

Properties: It is a mixture of the n-butyl esters of 2,4-d and 2,4,5-t and the isobutyl ester of 2,4,5-t, at concentrations of 0.50, 0.31, and 0.22 kg/l, respectively.

Use: A herbicide used by the U.S. military forces to control vegetation early in the Vietnam conflict, but it was replaced by agent orange in 1964.

agent white. (herbicide white).

Properties: It is a mixture of the triisopropanolamine salt of 2,4-d and picoram, at respective concentrations of 0.24 and 0.07 kg/l.

Use: A herbicide used by the U.S. military forces to control vegetation in the Vietnam conflict.

age-resister. See antioxidant.

agg. ((2S)-2-(butylsulfonylamino)-3-[4-(4-piperidin-4-ylbutoxy)phenyl]propanoic acid). $C_{22}H_{36}N_2O_5S$. A codon of arginine that directs the placement of arginine into a polypeptide.

agglomeration. (1) Combination or aggregation of colloidal particles suspended in a liquid into clusters or "flocs" of approximately spherical shape. It is usually achieved by neutralization of the electric charges which maintain the stability of the colloidal suspension. The terms *flocculation* and *coagulation* have a closely similar meaning. (2) The food industry uses "agglomeration" in the sense of increasing the particle size of powdered food products. Because such powders tend to be hydrophobic because of the high surface tension of water, agglomeration causes them to be more readily dispersible in water—a process known as "instantizing." The agglomerates have varying degrees of open spaces (voids) and are loosely bound, foam-like structures. They are formed by mechanical means in chamber spray dryers, tubes, or fluidized beds, usually in the presence of moisture.

See aggregation; agglutination; flocculation; coagulation.

agglutination. The combination or aggregation of particles of matter under the influence of a specific protein. The term is usually restricted to antigen-antibody reactions characterized by a clumping together of visible cells such as bacteria or erythrocytes. The antigen is called an agglutino-gen, and the antibody an agglutinin because of an apparent gluing or sticking action.

See aggregation.

agglutinin. An antiantibody whose activity is directed against the idiotype of a specific immunoglobulin antibody that under certain circumstances will cause organic particles coated with a specific antigen or cells that contain the antigen to agglutinate.

aggregate. A collective term denoting any mixture of such particulates as sand, gravel, crushed stone, or cinders used in Portland cement formulations, road building, paving compositions, animal husbandry, trickle filters, horticulture, etc.

aggregation. A general term describing the tendency of large molecules or colloidal particles to combine in clusters or clumps, especially in solution. When this occurs, usually as a result of removal of the electric charges by addition of an appropriate

electrolyte, by the action of heat, or by mechanical agitation, the aggregates precipitate or separate from the dissolved state. Included in this term are the more specific terms *agglutination*, *coagulation*, *flocculation*, *agglomeration*, and *coalescence*.

aggregation technique. A technique used in model organism studies in which embryos at the 8-cell stage of development are pushed together to yield a single embryo (used as an alternative to microinjection).
See model organisms.

aging. (1) *Deleterious*: gradual deterioration of a material due to long exposure to the environment. Aging characteristics of various materials:

- (a) Vulcanized rubber and thermoplastic polymers lose strength and crack due to oxidation, sunlight, heat; this is retarded by antioxidants, e.g., phenyl- β -naphthylamine. For accelerated aging tests see bomb.
- (b) Foods: spoilage and rancidity due to bacterial contamination, retarded by butylated hydroxyanisole and various propionates.
- (c) Paints: cracking, fading, chalking due to exposure to weather and photochemical degradation. Retarded by proper selection of vehicles and pigments. Accelerated weathering tests are used.
- (d) Metals: rusting, pitting, and scaling due to corrosion, especially in moist acid and alkaline environments. Avoided by use of alloys in which non-corrosive metals are incorporated (stainless steel) or by plating or cladding the base metal with chromium or nickel.

See corrosion; exposure testing.

(2) *Beneficial*: improvement of flavor by long storage. Cheeses develop a "sharp" flavor on ripening for 9–12 months, wines develop a "bouquet" after 2 or more years of storage. Whiskeys stored in oaken casks for several years modify their flavor by extracting components of the wood. Tobacco is aged from 3 to 5 years after curing to remove unpleasant odors and improve smoking qualities.

agitator. Any rotating device that induces motion in fluid mixtures over a wide range of viscosities, thus effecting uniform dispersion of their components. An important class of agitators comprises impellers which produce turbulent flow in liquids of low viscosity; their diameter is much less than that of the container. They may be either top-entering (vertical) or side-entering (at an angle of approximately 45°); medium-viscosity liquids are agitated by paddles attached to a central rotating member. Pastes and high-viscosity mixtures in which no turbulent flow is possible require agitators that closely fit the mixing chamber so as to provide the necessary shearing and squeezing action throughout the mass. These are kneading devices utilizing curved or helical rotors or sigma blades, either single or double. Screw-type agitators permit continuous mixing by means of multiple shearing

and blending actions. The so-called ribbon agitators are effective for dry powders, slurries, etc. A number of ingenious modifications and combinations of these types are widely used in the process industries. Most are available in laboratory sizes. See impeller; mixing; kneading; screw.

aglucon. The nonglucose portion of a glucoside.

aglucone. The nonsugarlike portion of a glucoside molecule.
See glycoside.

aglycon. (aglycone; genin). The noncarbohydrate moiety resulting from hydrolysis of a glycoside molecule.

aglycone. A nonsugar hydrolytic product of a glycoside.
See glycoside.

agmatine. (2-(4-aminobutyl)guanidine; 4-(aminobutyl)guanidine; 1-amino-4-guanidobutane).
CAS: 306-60-5. $C_5H_{14}N_4$. Decarboxylated arginine.

Derivation: Occurs in ergot, sponges, the salivary glands of cephalopods, the pollen of *Ambrosia artemisiifolia*, herring sperm, and in octopus muscle.

Agre, Peter. (1949–). An American born in Northfield, Minnesota who won the Nobel Prize for chemistry in 2003 for his pioneering work concerning discoveries about water channels in cell membranes. Agre received an undergraduate degree from Augsburg College and an M.D. from Johns Hopkins University, where he continues his research.

agricultural chemical. (agrichemical). A chemical compound or mixture used to increase the productivity and quality of farm crops. Included are fertilizers, soil conditioners, fungicides, insecticides, herbicides, nematocides, and plant hormones.

agricultural waste. See biomass; waste control; gasohol.

agrimex. See avermectin b(sub 1).

"Agrisel Carbait 5 Insecticide" [Agrisel]. TM for a turf insecticide for ornamental and agricultural grass.
Use: Controls 120 pests.

agromet. See *n*-(2,6-dimethylphenyl)-*n*-(methoxy)alanine methyl ester.

"Agsolex" [ISP]. TM for chemical used as an agricultural solvent.

agstone. (agricultural limestone; calcium carbonate).

CAS: 1317-65-3. CCaO_3 . Carbonic acid calcium salt.

Properties: Odorless, tasteless powder or crystal.

Use: To lime soil; therapeutically as a phosphate buffer in hemodialysis patients and as a calcium supplement.

agu. (2-aminoguanidine).

CAS: 79-17-4. CH_6N_4 . A codon of serine that directs the placement of serine into a polypeptide.

ah locus. A gene locus that regulates the induction of various enzymes by aromatic hydrocarbons.

AHMT (perfume). See: ethanone, 1-(5,6,7,8-tetrahydro-3,5,5,6,8,8-hexamethyl-2-naphthalenyl)-.

AI3-36161.

CAS: 108910-63-0.

Hazard: Moderately toxic by ingestion. Low toxicity by inhalation. A severe skin and moderate eye irritant.

Use: Agricultural chemical.

AIC. See American Institute of Chemists.

AICHe. See American Institute of Chemical Engineers.

air. A mixture (or solution) of gases, the composition of which varies with altitude and other conditions at the collection point. Following is the composition of dry air at sea level:

Substance	% by wt	% by vol
Nitrogen	75.53	78.00
Oxygen	23.16	20.95
Argon		0.93
Carbon dioxide		0.033*
Neon		0.0018
Helium		0.0005
Methane		0.0002
Krypton		0.0001
Nitrous oxide		0.000,05
Hydrogen		0.000,05
Xenon		0.000,008
Ozone		0.000,001

*The CO_2 content of air has increased 12–15% since 1900 due to combustion of fossil fuels.

See greenhouse effect. The density of dry air is 1.29 g/L at 0C and 760 mm Hg. It is noncombustible, but will support combustion. Liquid air is air that has been subjected to a series of compression, expansion, and cooling operations until it liquefies.

Use: Source of oxygen, nitrogen, and rare gases; coolant; power source (compressed); cryogenic agent (liquid); particle classification; blowing agent (asphalt, soap, ice-cream mixes, whipped cream, etc.); flotation.

air classification. The separation of solid particles according to weight and/or size, by suspension in and settling from an air stream of appropriate velocity, as in air-floated clays and other particulate products.

airedale brown md. See C.I. direct brown 2.

air floatation. See air classification.

air gas. See producer gas.

air knife. See doctor knife.

air pollution. (atmospheric pollution). Introduction of substances into the atmosphere that are not normally present therein and that have a harmful effect on humans, animals, or plant life. Photosynthesis is significantly inhibited by air pollutants, especially in urban areas. The worst offenders are sulfur dioxide (which forms sulfuric acid on contact with water vapor); automotive emission products; metal dusts from smelters, coal smoke, and other particulates; formaldehyde and acrolein; and radioactive emanations. Control of these is exercised by the Environmental Protection Agency. As conventionally used, the term does not apply to interior air spaces such as industrial workrooms. TLVs (Threshold Limit Values) for the latter are established by the American Conference of Governmental Industrial Hygienists (ACGIH) and by OSHA. See environmental chemistry.

aizen direct deep black eh. See apomine black gx.

"Ajicure" [Ajinomoto]. TM for a line of epoxy curing agents.

"Ajisper" [Ajinomoto]. TM for a pigment dispersing agent.

ajugarin. Any of a class of diterpenes that are effective antifeedants against the African Army Worm, a moth larva (family noctuidae) that feeds on alfalfa and various grains, sometimes in huge numbers.

Derivation: From the leaves of *Ajuga remota* (bugle weed) and related plants.

Use: Insecticide.

Akabori amino acid reactions. (1) Formation of aldehydes by oxidative decomposition of α -amino acids when heated with sugars. (2) Reduction of α -amino acids and esters by sodium amalgam and ethanolic hydrochloric acid to the corresponding α -amino aldehydes. (3) Formation of alkamines by heating mixtures of aromatic aldehydes and amino acids. No reaction has been observed with tertiary amino groups.

aklomite.

CAS: 3011-89-0. $\text{C}_7\text{H}_5\text{ClN}_2\text{O}_3$.

Properties: Crystals and gray scales from alc. Mp: 172C.

Use: Drug (veterinary); food additive.

“Akroflex” C [Du Pont]. TM for a rubber antioxidant containing 35% diphenyl-*p*-phenylenediamine $C_6H_4(NHC_6H_5)_2$ and 65% phenyl- α -naphthylamine (“Neozone”, A).

Use: To improve the aging and service life of rubbers; anti-cross-linking agent for SBR (styrene-butadiene-rubber).

“Akucell” [Akzo Nobel].

CAS: 9004-32-4. TM for anionic water-soluble sodium carboxymethylcellulose polymer.

Use: As a binder, thickener, and suspension agent in food and pharmaceuticals.

Al. Symbol for aluminum.

alabaster. A fine-grained compact gypsum.

alachlor. (Lasso; 2-chloro-*N*-(2,6-diethylphenyl)-*N*-(methoxymethyl)acetamide; 2-chloro-2',6'-diethyl-*N*-(methoxymethyl)acetanilide; metachlor).

CAS: 15972-60-8. CH_6N_4 . A preemergence selective anilide that is absorbed through the roots and inhibits root elongation. Alachlor persists in the soil for up to 3 months. It is a common groundwater pollutant in some agricultural areas.

Hazard: Toxic; questionable carcinogen; allergen; irritant; measured as inhalable fraction and vapor; may cause dermal sensitization; hemosiderosis of the liver, spleen and kidney.

Use: Herbicide to control weeds in corn and soybean fields.

“Alamine 304” [Henkel]. (trilaurylamine). TM for organic acid and metal extraction additive.

Use: For paints, plastics, and rubbers.

“Alanap” [Chemtura]. TM for *N*-1-naphthylphthalamic acid.

Use: A herbicide.

alanine. (α -alanine; α -aminopropionic acid; 2-aminopropanoic acid). $CH_3CH(NH_2)COOH$. A nonessential amino acid.

Properties: Colorless crystals. Soluble in water; slightly soluble in alcohol; insoluble in ether. Optically active.

DL-alanine, mp 295C (decomposes), sublimes at 200C.

L(+)-alanine, mp 297C (decomposes).

D(-)-alanine, mp 295C (decomposes).

L(+)-alanine hydrochloride; prisms, mp 204C (decomposes).

L(+)-alanine, *N*-acetyl-, crystals, mp 116C.

L(+)-alanine, *N*-benzoyl-, crystals, mp 152–154C.

Derivation: Hydrolysis of protein (silk, gelatin, zein), organic synthesis.

Grade: Reagent, technical.

Use: Microbiological research, biochemical research, dietary supplement.

β -alanine. (3-aminopropanoic acid; β -aminopropionic acid). $NH_2CH_2CH_2COOH$. A naturally occurring amino acid not found in protein.

Properties: White prisms. Mp 198C (decomposes). Soluble in water; slightly soluble in alcohol, insoluble in ether. The pH of a 50% solution is 6.0–7.3. Hydrochloride plates and leaflets: mp 122.5C. Platinichloride: yellow leaflets, mp 210C (decomposes).

Derivation: Addition of ammonia to β -propiolactone, other processes based on the reaction of ammonia with acrylonitrile, etc.

Use: Biochemical research, organic synthesis, calcium pantothenate production, buffer in electroplating.

dl-alanine.

CAS: 302-72-7. $C_3H_7NO_2$.

Properties: Needles or prisms, or white crystalline powder; odorless with a sweet taste. Mp: 295C (decomposes). Slightly sol in water, insol in Et_2O .

Hazard: Low toxicity by ingestion.

Use: Food additive.

alanine aminotransferase. (alt; alanine transaminase; glutamin-pyruvic transaminase).

CAS: 9000-86-6. An enzyme that catalyzes the transfer of amino groups from L-alanine to 2-ketoglutarate, or the reverse reaction from L-glutamate to pyruvate.

alanine-oxomalonate aminotransferase.

An enzyme that effects the transfer of the L-alanine group to oxomalonate.

alanosine. $C_3H_7N_3O_4$.

Properties: Finely divided crystals. Decomposes at 190C, optically active. Can be prepared in *l*-, *d*-, and *dl*-forms. Insoluble in most organic solvents; slightly soluble in water.

Derivation: Fermentation of *Streptomyces alanosinus*; also synthetically.

Use: Inhibitor of insect reproduction, antineoplastic, antibiotic.

β -alanylhistidine. See carnosine.

Alar. A plant growth regulator (succinic acid-2,2-dimethylhydrazide) that improves the color and texture of apples, grapes, and tomatoes, and prevents premature dropping; growth retardant; multiple-flower stimulator.

alarmona. One of a class of cell-growth regulating metabolites (nucleotides) that enable bacteria to respond to metabolic and environmental changes. They are thought to act by controlling or affecting several biochemical reactions simultaneously,

"ALATHON"

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but the exact mechanism of their behavior has not been elucidated. One such nucleotide, discovered in 1982, is known as ZTP (5-amino-4-imidazole carboximide riboside-5'-triphosphate). See nucleotide.

"Alathon" [*LyondellBasell*]. TM for a polyethylene resin. "Alathon" G-0530, designated as a reinforced polyethylene, contains 30% by weight of glass fiber treated with a proprietary coupling agent that optimizes its reinforcing properties.

albendazole sulfone. See 5-(propylsulfonyl)-2-benzimidazolecarbamate methyl ester.

Alberti furnace. A reverberatory furnace for roasting mercury ores, the mercury being condensed in iron tubes and brick chambers.

Albert Precht effect. A technique used in photography to produce a reversed image. The exposed surface is immersed in chromic acid. It is then exposed to uniform light and developed over.

Albigen. A water-soluble polymer used in the textile industry for stripping vat and other dyestuffs. Has no affinity for the fiber and promotes the stripping effect of alkaline hydrosulfite solutions.

albino rat. A phenotype that sometimes occurs in various populations of *Rattus*. The fur is white and the eyes are pink due to a lack of pigment.

"Albone" [*Arkema*]. TM for a series of hydrogen peroxide solutions which vary in hydrogen peroxide content from 35 to 90% by weight. See hydrogen peroxide.

albumen. A 66.3 kDa protein comprising most of the protein in serum and largely responsible for buffering pH and volume of blood. Commercial term for dried egg white used in the food industry. See albumin, egg.

albumin. Any of a group of water-soluble proteins of wide occurrence in such natural products as milk (lactalbumin), blood serum, and eggs (ovalbumin). They are readily coagulated by heat and hydrolyze to α -amino acids or their derivatives.

albumin, egg. (ovalbumin). Chief protein occurring in egg white as a viscous, colorless fluid; it becomes an amorphous solid when dried, which can be reconstituted with water. It is a heat-sensitive colloidal material that coagulates irreversibly at approximately 60C (140F). The dried product is available in commercial quantities.

Use: Protective colloid and emulsifying agent in bakery products (especially angel cake), clarification of wines, adhesives, paper coatings, pharmaceuticals,

enzyme activation, lithography, analytical reagent, antidote for mercury poisoning, mordant in dyes.

Note: A recombinant DNA technique has made possible the formation of ovalbumin by the bacterium *Escherichia coli*.

albumin, milk. (lactalbumin). A component of skim milk protein (2–5%). Can be crystallized. Exact function is not known, but probably aids in stabilization of the fat particles. See milk.

ALCA. See American Leather Chemists' Association.

alchemy. The predecessor of chemistry, practiced from as early as 500 BC through the 16th century. Its two principal goals were transmutation of the baser metals into gold and discovery of a universal remedy. Modern chemistry grew out of alchemy by gradual stages.

alchlor process. To remove the unstable components of lubricating oil, this process used aluminum chloride instead of sulfuric acid.

alcian blue.

Properties: Greenish-black crystals with metallic sheen. Soluble in ethanol, cellosolve, ethylene glycol.

Use: Gelling agent for lubricating fluids, bacterial stain for histiocytes and fibroblasts.

Alcoa Mill Products. A wide variety of aluminum sheet and formed products.

Alcoa process. A more efficient method of producing aluminum from bauxite that requires one-third less electric power than the Hall process. Alumina is reacted with chlorine, the resulting aluminum chloride yielding the metal and chlorine on electrolysis. No fluorine is required in the process. Prototype plants are under development.

Alcoa Wheel Forged Products. A wide variety of aluminum forged products.

alcogel. A gel formed by the coagulation of a solution in which the liquid is an alcohol. The result is a mixture of liquid and solid parts within the same volume.

alcohol. A broad class of hydroxyl-containing organic compounds occurring naturally in plants and made synthetically from petroleum derivatives such as ethylene. Many are manufactured in tonnage quantities.

The many types may be summarized as follows:

- I. Monohydric (1 OH group)
 - (1) Aliphatic
 - (a) paraffinic (ethanol)
 - (b) olefinic (allyl alcohol)

- (2) Alicyclic (cyclohexanol)
- (3) Aromatic (phenol, benzyl alcohol)
- (4) Heterocyclic (furfuryl alcohol)
- (5) Polycyclic (sterols)

II. Dihydric (2 OH groups): glycols and derivatives (diols)

III. Trihydric (3 OH groups): glycerol and derivatives

IV. Polyhydric (polyols) (3 or more OH groups)

Use: Organic synthesis for solvents, detergents, beverages, pharmaceuticals, plasticizers, and fuels.

For further information, see monohydric, dihydric, trihydric, polyol, and specific alcohol.

alcohol, absolute. See ethyl alcohol.

alcohol dehydrogenase. An enzyme found in animal and plant tissue that acts upon ethanol and other alcohols producing acetaldehyde and other aldehydes.

Use: Biochemical research.

alcohol, denatured.

CAS: 64-17-5. Ethanol to which another liquid has been added to make it unfit to use as a beverage (chiefly for tax reasons). In the U.S., it may be either Completely Denatured (CDA) or Specially Denatured (SDA). At least 50 formulations are officially authorized for making denatured alcohol. They include the following denaturants: SDA 40B must contain brucine, brucine sulfate, or quassin plus *tert*-butanol; SDA 40A must contain sucrose octaacetate plus *tert*-butyl alcohol; SDA 40B must contain "Bitrex" [*Johnson Matthey*] and *tert*-butyl alcohol; SDA40C must contain only *tert*-butyl alcohol. For exact formulas, consult 27CFR Part 21 and the Alcohol and Tobacco Tax Division of IRS, Washington D.C.

Properties: See ethanol.

Hazard: Flammable, dangerous fire risk.

Use: Manufacture of acetaldehyde and other chemicals, solvents, antifreeze and brake fluids, fuels. See ethanol.

alcohol fermentation. The anaerobic conversion of glucose to ethanol via anaerobic glycolysis. See also fermentation.

alcohol, grain. Ethanol made from grain.

alcohol, industrial. A mixture of 95% ethanol and 5% water, plus additives for denaturing or special solvent purposes. See alcohol, denatured.

alcohols, C8-C10, ethoxylated propoxylated.

CAS: 68603-25-8.

Hazard: A severe eye irritant.

alcohols, C12-C6, ethoxylated.

CAS: 68551-12-2.

Hazard: A moderate eye irritant.

alcohols, C12-C13, ethoxylated.

CAS: 66455-14-9.

Hazard: Moderately toxic by ingestion and skin contact. A moderate skin irritant.

alcohols, C12-C15, ethoxylated.

CAS: 68131-39-5.

Hazard: Moderately toxic by ingestion.

alcohols, C14-C15, ethoxylated.

CAS: 68951-67-7.

Hazard: Moderately toxic by ingestion.

alcohols, C16-C18, ethoxylated.

CAS: 68439-49-6.

Hazard: Moderately toxic by ingestion and skin contact. A moderate skin and eye irritant.

alcohol, wood. See methyl alcohol.

alcoholate. (alkoxide).

Properties: Ionic organic compound.

Derivation: By replacement of the hydrogen of a hydroxyl group from an alcohol usually by an alkali metal.

alcoholic extract.

Properties: Solid.

Derivation: Extraction from the alcohol-soluble principles of a drug, followed by evaporation of the alcohol.

alcoholysis. A chemical reaction between an alcohol and another organic compound analogous to hydrolysis. The alcohol molecule decomposes to form a new compound with the reacting substance, the other reaction product is water. Both hydrolysis and alcoholysis may be considered as forms of solvolysis.

See solvolysis.

"Alconox" [Alconox]. TM for a powdered precision cleaner.

Use: For manual and ultrasonic systems for glassware, metal, ceramic, and other materials in laboratories.

Aldactazide. A combination of spironolactone and hydrochlorothiazide.

Use: Drug.

"Aldactone" [Pfizer]. TM for spironolactone.

Use: Drug.

aldazine. An azine of an aldehyde that contains two or more nitrogen atoms.

aldehyd. An oxidation product of kerosene that is used as a denaturant of ethanol.

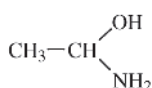
aldehydase. (aldehyde oxidase). An enzyme that catalyzes reactions that produce acids from aldehydes.

ALDEHYDE

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aldehyde. A broad class of organic compounds having the generic formula RCHO, and characterized by an unsaturated carbonyl group (C=O). They are formed from alcohols by either dehydrogenation or oxidation, and thus occupy an intermediate position between primary alcohols and the acids obtained from them by further oxidation. Their chemical derivation is indicated by the name *al*(cohol) + *dehyd*(rogenation). Aldehydes are reactive compounds participating in oxidation, reduction, addition, and polymerization reactions. For specific properties, see individual compounds.

aldehyde ammonia. (acetaldehyde ammonia; 1-amino-ethanol). $\text{CH}_3\text{CH}_2\text{ONH}_2$.



Properties: White, crystalline solid. Mp 97C (partly decomposes). Stable in closed containers; resinifies on long exposure to air. Very soluble in water and alcohol.

Derivation: Action of acetaldehyde on ammonia.

Hazard: Irritant to eyes and skin; moderate fire risk.

Use: Accelerator for vulcanization of thread rubber, organic synthesis, source of acetaldehyde and ammonia.

aldehyde C-18. See δ -nonalactone.

aldehyde collidine. See 2-methyl-5-ethylpyridine.

aldehyde dehydrogenase.

CAS: 9028-86-8. An enzyme that catalyzes the formation of acids from aldehydes.

aldehyde hydrate. A compound produced by the oxidation of a hydrate of aldehyde.

aldehyde oxidase. A flavoprotein that occurs in the soluble fraction of hepatic cells that catalyzes chiefly the oxidation of endogenous aldehydes.

aldehydine. See 2-methyl-5-ethylpyridine.

Alder, Kurt. (1902–1958). A German chemist who won the Nobel Prize for chemistry along with Otto Diels in 1950 for a project involving a practical method for making ring compounds from chain compounds by forcing them to combine with maleic anhydride. This is known as the Diels–Alder reaction and provided a method for synthesis of complex organic compounds. Alder had degrees from the Universities of Berlin and Kiel.

Alder–Rickert rule. Adducts of 1,3-cyclohexadiene derivatives with acetylenedicarboxylic esters give phthalate ester and ethylene

on heating. Similar adducts of cyclopentadiene revert on heating to starting materials (retro-Diels–Alder).

Alder–Stein rules. Set of rules governing the stereochemistry of the Diels–Alder reaction. The most important are that (1) the stereochemical relationship of groups attached to the diene and the dienophile is maintained in the product (*cis*-addition); and (2) the product resulting from maximum accumulation of unsaturated centers in the transition state is favored (endo rule).

aldicarb.

CAS:116-06-3. $\text{CH}_3\text{SC}(\text{CH}_3)_2\text{HC:NOCONHCH}_3$.

Properties: Colorless crystals. Mp 100C (212F).

Almost insoluble in water; slightly soluble in benzene and xylene; partly soluble in acetone and methylene chloride.

Hazard: Toxic by ingestion. Questionable carcinogen.

Use: Nematocide, insecticide.

aldimine. (methenamine). CH_3N . Any of a class of amines derived from an aldehyde.

alditol. Any of a class of acyclic polyols that are derived from an aldose by reduction of the carbonyl group.

aldobiuronic acid. Any of a number of condensation products of an aldose and a uronic acid.

aldohexose. (pentahydroxyhexanal). $\text{C}_6\text{H}_{12}\text{O}_6$. A hexose that contains an aldehyde group. A primary source of energy for living organisms.

Derivation: Found in fruits and other parts of plants.

Use: Therapeutically in fluid and nutrient replacement.

aldoketose. Any of a subgroup of monosaccharides, saccharides, uronic acids, and aminosugars.

aldol. (acetaldol; β -hydroxybutyraldehyde). $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CHO}$.

Properties: Water-white to pale yellow, syrupy liquid. Decomposes into crotonaldehyde and water on distillation under atmospheric pressure. Miscible with water, alcohol, ether, organic solvents. D 1.1098 (15.6/4C), bp 83C (20 mm), vap press less than 0.1 mm (20C), specific heat 0.737, bulk d 9.17 lb/gal (20C), fp below 0C. Flash p 150F (65.5C) (OC), autoign temp 530F (276.6C). Combustible.

Derivation: By condensation of acetaldehyde in sodium hydroxide solution.

Grade: Technical (98%).

Hazard: Moderate fire risk.

Use: Synthesis of rubber accelerators and age resisters, perfumery, engraving, ore flotation, solvent, solvent mixtures for cellulose acetate, fungicides, organic synthesis, printer's rollers, cadmium plating, dyes, drugs, dyeing assistant, synthetic polymers.

aldolase. (zymohexase). An enzyme present in muscle involved in glycogenolysis and anaerobic glycolysis. It catalyzes production of dihydroxyacetone phosphate and phosphoglyceric aldehyde from fructose-1,6-diphosphate.

Use: Biochemical research.

aldol condensation. A reaction between two aldehyde or two ketone molecules in which the position of one of the hydrogen atoms is changed in such a way as to form a single molecule having one hydroxyl and one carbonyl group. Since such a molecule is partly an alcohol (OH group) and partly an aldehyde (CHO group) and represents a union of two smaller molecules, the reaction is called an aldol condensation. It can be repeated to form molecules of increasing molecular weight. The condensation of formaldehyde to sugars in plants, which on repetition builds up the more complex carbohydrate structures such as starch and cellulose, is thought to be a reaction of this type. It occurs most effectively in an alkaline medium.

Aldo MO. (glycerol monooleate).

CAS: 25496-72-4. An antifog agent and dispersant.

Use: Bath oils, lotions, and creams; emulsifier for liquid and paste waxes, polish, and cleaners.

aldo- α -naphthylamine condensate.

Properties: Orange to dark red solid with characteristic odor. Softens at 64C min, d 1.16. Insoluble in water, gasoline; slightly soluble in alcohol and petroleum hydrocarbons; soluble in acetone, benzene, chloroform, and carbon disulfide.

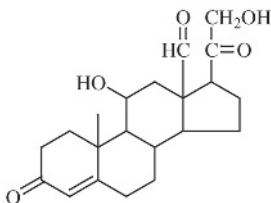
Use: Antioxidant in tire carcasses, tubes, insulating tape, black soles.

aldonic acid. (glyconic acid; 2,3,4,5,6-pentahydroxyhexanoic acid). $C_6H_{12}O_7$. A monosaccharide derivative or polyhydroxy acid in which the aldehyde group has been oxidized to a carboxyl group.

aldose. Any of a group of sugars whose molecule contains an aldehyde group and one or more alcohol groups. An example is glyceraldehyde ($HOCH_2 \cdot CH_2O \cdot CHO$), specifically called an aldotriose because it contains three carbon atoms.

aldoside. A glucoside in which the sugar moiety is an aldose.

aldosterone. (electrocortin). $C_{21}H_{28}O_5$.



An adrenal cortical steroid hormone that is the most powerful mineralocorticoid. Probably the chief regulator of sodium, potassium, and chlorine metabolism; approximately 30 times as active as deoxycorticosterone.

Properties: Crystals. Mp 108–112C.

Derivation: Isolated from adrenals; has been synthesized.

Use: Medicine.

aldoxime. The $-CH:NOH$ radical resulting from reactions between aldehydes and hydroxylamine or by the oxidation of primary amines by persulfuric acid.

Properties: Colorless. Water soluble.

aldrin. (HHDN).

CAS: 309-00-2. $C_{12}H_8Cl_6$. The assigned common name for an insecticidal product containing 95% or more of 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-*endo,exo*-dimethanonaphthalene.

Properties: Brown to white, crystalline solid. Mp 104–105.5C. Insoluble in water; soluble in most organic solvents. Not affected by alkalis or dilute acids, compatible with most fertilizers, herbicides, fungicides, and insecticides.

Grade: Technical.

Hazard: Toxic by skin absorption. Central nervous system impairment, and liver and kidney damage. Questionable carcinogen.

Use: Insecticide.

See dieldrin; endrin.

Aldyl. A high-strength polyethylene pipe composed principally of "Alathon."

ale. See brewing.

alendronic acid. See 4-amino-1-hydroxybutane-1,1-diylidiphosphonic acid.

aleuritic acid. (9,10,16-trihydroxyhexadecanoic acid).

CAS: 533-87-9. $HOCH_2(CH_2)CH(OHCH(OH)(CH_2)COOH$.

Use: Perfumes.

alfin. A catalyst obtained from alkali alcoholates derived from a secondary alcohol which is a methyl carbinol and olefins possessing the grouping $-CH=CH-CH_2-$, which may be part of a ring, as in toluene. The interaction of the alkali alcoholate (sodium isopropoxide) with the olefin halide (allyl chloride) gives a slurry of sodium chloride on which sodium isopropoxide and allyl sodium are adsorbed. This slurry is a typical alfin catalyst used to convert olefins into polyolefins. The elastomers produced are called alfin rubbers.

alfuzosin hydrochloride. See xatral.

ALGAE

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algae. Chlorophyll-bearing organisms occurring in both salt- and freshwater; they have no flowers or seeds, but reproduce by unicellular spores. They range in size from single cells to giant kelp over 100 ft long, and include most kinds of seaweed. There are four kinds of algae: brown, red, green, and blue-green. Blue-green algae are said to be the earliest form of life to appear on earth. The photosynthetic activity of algae accounts for the fact that over two-thirds of the world total photosynthesis takes place in the oceans. Algae are harvested and used as food supplements (see carrageenan, agar), soil conditioners, animal feeds, and a source of iodine; they also contain numerous minerals, vitamins, proteins, lipids, and essential amino acids. Alginic acid is another important derivative. Blue-green algae are water contaminants and are toxic to fish and other aquatic life. Phosphorus compounds in detergent wastes stimulate the growth of algae to such an extent that overpopulation at the water surface prevents light from reaching many of the plants; these decompose, removing oxygen and releasing carbon dioxide, thus making the water unsuitable for fish. Algae are being used in treatment of sewage and plant effluent in a proprietary flocculation process.

See eutrophication; agar; biomass.

algae, brown.

Properties: Various seaweeds harvested in coastal waters of the northern Atlantic and the Pacific oceans.

Use: Food additive.

algae meal, dried.

Properties: Mixture of algae cells from *Spongiococcum*, molasses, corn steep liquor, and a maximum of 0.3% ethoxyquin.

Use: Food additive.

algae, red.

Properties: Various seaweeds harvested in coastal waters of Pacific ocean.

Use: Food additive.

algaet.

Use: Food additive.

Algar–Flynn–Oyamada reaction. Alkaline hydrogen peroxide oxidation of *o*-hydroxyphenyl styryl ketones (chalcones) to flavonols via the intermediate dihydroflavonols.

Algene. Quaternary ammonium compounds.

Use: As cationic surfactants.

algestone acetoneide. See progesterone 16,17-acetoneide.

algicide. Chemical agent added to water to destroy algae. Copper sulfate is commonly employed for large water systems.

algin. A hydrophilic polysaccharide (phycocolloid or hydrocolloid) found exclusively in the brown algae. It is analogous to agar. The seaweed (giant kelp) is sea harvested, water extracted, and refined. U.S. (California) and Great Britain are the chief producers.

See alginic acid; alginate.

alginate. Any of several derivatives of alginic acid (e.g., calcium, sodium, or potassium salts or propylene glycol alginate). They are hydrophilic colloids (hydrocolloids) obtained from seaweed. Sodium alginate is water soluble but reacts with calcium salts to form insoluble calcium alginate.

Use: Food additive (thickener, stabilizer), yarns and fibers, medicine (first-aid dressings), meat substitute, high-protein food analogs.

alginic acid. $(C_6H_8O_6)_n$. A polysaccharide composed of β ,*d*-mannuronic acid residues linked so that the carboxyl group of each unit is free, while the aldehyde group is shielded by a glycosidic linkage. It is a linear polymer of the mannuronic acid in the pyranose ring form.

Properties: White to yellow powder possessing marked hydrophilic colloidal properties for suspending, thickening, emulsifying, and stabilizing. Insoluble in organic solvents, slowly soluble in alkaline solutions. Absorbs up to 300 times its weight of water.

Grade: Refined (food), technical (commercial), NF (sodium alginate), FCC.

Use: Food industry as thickener and emulsifier; protective colloid in ice cream, toothpaste, cosmetics, pharmaceuticals, textile sizing, paper coatings; waterproofing agent for concrete; boiler water treatment; oil-well drilling muds; storage of gasoline as a solid.

alicyclic. A group of organic compounds characterized by arrangement of the carbon atoms in closed ring structures sometimes resembling boats, chairs, or even birdcages. These compounds have properties resembling those of aliphatics and should not be confused with aromatic compounds having the hexagonal benzene ring. Alicyclics comprise three subgroups: (1) cycloparaffins (saturated); (2) cycloolefins (unsaturated, with two or more double bonds); and (3) cycloacetylenes (cyclynes) with a triple bond. The best-known cycloparaffins (sometimes called naphthenes) are cyclopropane, cyclohexane, and cyclopentane; typical of the cycloolefins are cyclopentadiene and cyclooctatetraene. Most alicyclics are derived from petroleum or coal tar. Many can be synthesized by various methods.

alicyclic acid. Any acid that contains a saturated ring.

aliphatic. One of the major groups of organic compounds, characterized by straight- or branched-chain arrangement of the constituent carbon atoms.

Aliphatic hydrocarbons comprise three subgroups: (1) paraffins (alkanes), all of which are saturated and comparatively unreactive, the branched-chain types being much more suitable for gasoline than the straight-chain; (2) olefins (alkenes or alkadienes), which are unsaturated and quite reactive; (3) acetylenes (alkynes), which contain a triple bond and are highly reactive. In complex structures, the chains may be branched or cross-linked.

See alicyclic; aromatic; chain.

aliphatic acid. An organic acid.

Derivation: From an aliphatic (nonaromatic) hydrocarbon.

aliphatic alcohol. (alkyl alcohol). An alcohol in which the hydroxyl groups are attached to a carbon atom of a branched or straight-chain aliphatic hydrocarbon.

Hazard: Toxic.

Use: Industrial solvent.

aliphatic amine. (methanamine). CH_5N . Any amine in which the substituted hydrocarbons are aliphatic.

Hazard: Odorific; toxic.

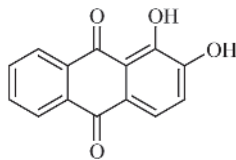
aliphatic amino acid. An amino acid that has a side chain with no aromatic components.

aliphatic esterase. (alkyl ester hydrolase). An esterase that catalyzes the hydrolysis of alkyl esters.

aliphatic hydrocarbon. A major class of hydrocarbons marked by arrangement of the constituent atoms into straight or branched-chain molecules. Aliphatic hydrocarbons do not contain aromatic rings. There are three subclasses: alkanes, alkenes, and alkynes.

aliquot. A part that is a definite fraction of a whole, as in aliquot samples for testing or analysis.

alizarin. (1,2-dihydroxyanthraquinone; CI 58000). $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_2(\text{OH})_2$. Parent form of many dyes and pigments including mordants.



Properties: Orange-red crystals; brownish-yellow powder. Mp 289C, bp 430C (sublimable). Soluble in aromatic solvents, hot methanol, and ether; sparingly soluble in water; moderately soluble in ethanol. Combustible.

Derivation: Anthracene is oxidized to anthraquinone, the sulfonic acid of which is

then fused with caustic soda and potassium chlorate; the melt is run into hot water and the alizarin precipitated with hydrochloric acid. Occurs naturally in madder root.

Grade: Technical.

Use: Manufacture of dyes, production of lakes, indicators, biological stain.

alizarin blue. (CI 67410). $\text{C}_{17}\text{H}_6\text{NO}_4$.

Properties: Violet crystals. Mp 268C. Insoluble in water, soluble in glacial acetic acid and hot benzene.

Use: Indicator.

alizarin yellow R. (*p*-nitrophenylazosalicylate sodium; CI 14030). $\text{O}_2\text{NC}_6\text{H}_4\text{NNC}_6\text{H}_3\text{OHCOONa}$.

Properties: Yellow-brown powder. Soluble in water.

Use: Acid-base indicator, biological stain.

alkadiene. See diolefin.

alkadiene. Any unsaturated aliphatic hydrocarbon with two double bonds.

alkadiyne. An alkyne that has two triple bonds.

alkali. Any substance which in water solution is bitter and is irritating or caustic to the skin and mucous membranes, turns litmus blue, and has a pH value greater than 7.0. The alkali industry produces sodium hydroxide, sodium carbonate (soda ash), sodium chloride, salt cake, sodium bicarbonate, and corresponding potassium compounds. See base; pH; alkali metal.

alkali blue. Class name for a group of pigment dry powders prepared by the phenylation of *p*-rosaniline or fuchsine, followed by drowning in hydrochloride acid, washing, and sulfonating. Alkali blue on a weight basis has the highest tinting strength of all blue pigments. The presscake may be "flushed" with vehicle to replace the water in the pulp.

Use: Printing inks, interior paints.

alkali cellulose. The product formed by steeping wood pulp with sodium hydroxide, the first step in the manufacture of viscose rayon and other cellulose derivatives.

See carboxymethylcellulose.

alkalide. A chemical compound that includes anions of alkali metals.

Properties: Low ionization potentials; thermally labile; unusual stoichiometry.

alkali earth metal. A term that refers to all six elements of Group II of the periodic table, that exhibit +2 oxidation state and are very reactive.

alkali metal. A metal in group IA of the periodic table, i.e., lithium, sodium, potassium,

ALKALIMETRY

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rubidium, cesium, and francium. Except for francium, the alkali metals are all soft, silvery metals, which may be readily fused and volatilized; the melting and boiling points becoming lower with increasing atomic weight. The density increases with (but less rapidly than) the atomic weight, the atomic volume therefore becoming greater as the series is ascended. The alkali metals are the most strongly electropositive of the metals. They react vigorously, at times violently, with water; within the group itself, the basicity increases with atomic weight, that of cesium being the greatest.

alkalimetry. The measurement of the concentration of bases or of the amount of free base present in a solution by titration or some other means of analysis.

alkaline battery. (alkaline cell). A dry cell battery in which the electrolyte contains potassium hydroxide.

alkaline cleaner. A cleaner whose action depends upon the presence of a caustic alkali, usually ammonium hydroxide or sodium hydroxide.

alkaline earth. An oxide of an alkaline earth metal (lime).

alkaline-earth metals. Calcium, barium, strontium, and radium (group IIA of the periodic table). In general they are white and differ by shades of color or casts; are malleable, extrudable, and machinable; may be made into rods, wire, or plate; are less reactive than sodium and potassium and have higher melting and boiling points.

alkaline phosphatase. Any of a class of enzymes that catalyze the hydrolysis of phosphate monoesters under conditions of alkaline pH. Elevated activity in blood serum usually indicates bone cancer, obstructive jaundice or Paget's disease.

alkaline salt. Any salt of a strong base.

Hazard: toxic; paralyzer.

alkaline soil. Soil that has pH value above 7.3.

alkaliphile. (alkalophile). An alkaliphilic organism.

alkaliphobe. An alkaliphobic organism.

alkali soil. Any soil with a pH of 8.5 or more that contains salts injurious to plant life.

alkaloid. A basic nitrogenous organic compound of vegetable origin. Usually derived from the nitrogen ring compounds pyridine, quinoline, isoquinoline, and pyrrole, designated by the ending -ine. Though some are liquids, they are usually colorless, crystalline solids, having a bitter taste, and which

combine with acids without elimination of water. They are soluble in alcohol, insoluble or sparingly soluble in water. Examples are atropine, morphine, nicotine, quinine, codeine, caffeine, cocaine, and strychnine.

alkaloid nitrogen oxide. Any alkaloid with a nitrogen oxide group that occurs in some plants.

alkaloidal reagent. An alkaloid that precipitates protein and may affect salt bridges and hydrogen bonds.

alkalophile. (alkaliphile). An organism that grows best under alkaline conditions (up to a pH of 10.5).

alkalosis. A metabolic condition in which blood pH decreases, usually the result of a metabolic condition or vomiting.

alkamine. ((2E,4E)-hexa-2,4-dienamide; amino alcohol). C_6H_9NO . An alcohol that contains an amine group.

alkane. See paraffin (1).

alkane series. A homologous series composed of methane, ethane, propane, butane, etc. The lower members of this series are gases while the high members are waxy solids.

alkanesulfonic acid, mixed. RSO_3H (R is methyl, ethyl, propyl, mixed). Trade designation for a mixture of methane-, ethane-, and propane sulfonic acids. A strong nonoxidizing, nonsulfonating liquid acid which is thermally stable at moderately high temperatures.

Properties: Light amber liquid; sour odor. Mp below $-40C$, bp $120-140C$ (1 mm), d 1.38 (20C), pH (1% solution) 1.15. Very corrosive. Miscible with water and saturated fatty acids.

Use: Catalyst; intermediate, reaction medium.

“Alkanol” [Du Pont]. TM for a series of fatty alcohol-ethylene oxide condensation products used as nonionic surface-active agents in detergents and dispersing and emulsifying agents in paper, leather, and textiles. These include grades OA, OE, OJ, OP, and HC. 189-S is a saturated hydrocarbon sodium sulfonate. B and BG are sodium alkylnaphthalene sulfonates. Sulfur is tetrahydronaphthalene sodium sulfonate.

alkanolamine. (alkylolamine). A compound such as ethanolamine, $HOCH_2CH_2NH_2$, or triethanolamine, $(HOCH_2CH_2)_3N$, in which nitrogen is attached directly to the carbon of an alkyl alcohol. See specific compound.

alkatriene. An acyclic hydrocarbon that contains three double bonds.

alkatriyne. An alkyne that has three triple bonds.

alkene. See olefin.

alkenyl halide. (alkenyl organohalide). Any organic compound that contains at least one halogen atom and one carbon-carbon double bond. They are widespread environmental toxicants that exhibit a wide range of acute and chronic toxicities.

alkoxide. Any of a class of compounds that are derivatives of alcohols.

alkoxy-alkylated mercury compound. An organomercurial compound that contains an alkoxy radical.

Use: pesticide.

alkoxyaluminum hydrides. (H_nAlOR_{3-n}). A group of reducing agents especially useful in converting epoxides to alcohols. Derived by reaction of aluminum hydride with the corresponding alcohol in tetrahydrofuran.

alkoxylate. An acyclic polyether.

alkyd resin. A thermosetting coating polymer, chemically similar to polyester resins, conventionally made by condensation and polymerization of a dihydric or polyhydric alcohol (ethylene glycol or glycerol) and a polybasic acid (phthalic anhydride), usually with a drying oil modifier. The process requires heating at 230–250°C for up to 12 hours. A new and quite different method utilizes epoxy addition polymerization, in which a mixture of glycidyl esters and organic acid anhydrides is heated with a metallic catalyst at 100°C or less for only 2–4 hours. Cost and energy savings and improved application performance are realized by this process.

Use: Alkyd resins are used as vehicles in exterior house paints, marine paints, and baking enamels. Molded alkyd resins are used for electrical components, distributor caps, encapsulation, and a variety of similar applications.

alkyl. A paraffinic hydrocarbon group which may be derived from an alkane by dropping one hydrogen from the formula. Examples are methyl CH_3- , ethyl C_2H_5- , propyl $CH_3CH_2CH_2-$, isopropyl $(CH_3)_2CH_2-$. Such groups are often represented in formulas by the letter R and have the generic formula C_nH_{2n+1} .
See aryl.

alkyl(C12-C15) alcohol ethoxylated.

CAS: 58391-12-1.

Hazard: Low toxicity by ingestion and skin contact. A moderate skin and mild eye irritant.

alkylamine. An alkane that contains an alkyl group attached to the nitrogen of an amine.

alkylaryl polyethyleneglycol ether.

Use: In surface-active agents.

See isooctylphenoxypolyoxyethylene ethanol for a typical example of this class of compound.

alkylaryl sulfonate. An organic sulfonate of combined aliphatic and aromatic structure, e.g., alkylbenzene sulfonate.

alkylate. (1) A product of alkylation. (2) A term used in the petroleum industry to designate a branched-chain paraffin derived from an isoparaffin and an olefin, e.g., isobutane reacts with ethylene (with catalyst) to form 2,2-dimethylbutane (neohexane). The product is used as a high-octane blending component of aviation and civilian gasolines. (3) In the detergent industry, the term is applied to the reaction product of benzene or its homologs with a long-chain olefin to form an intermediate, e.g., dodecylbenzene, used in the manufacture of detergents. It also designates a product made from a long-chain normal paraffin that is chlorinated to permit combination with benzene to yield a biodegradable alkylate. The adjectives *hard* and *soft* applied to detergents refer to their ease of decomposition by microorganisms.

See biodegradability; detergent.

alkylated mercury compound. (alkylmercury compound; alkylmercury; alkyl mercury). Any mercury-containing alkane.

alkylated organotin compound. (alkyltin compound; alkyltin). Any tin-containing alkane. A number of these compounds are immunotoxic and induce thymus atrophy without apparent effects on other organ systems.

alkylating agent. (1-methyl-1-nitroso-3-[(2S,3R,4R,5S,6R)-2,4,5-trihydroxy-6-(hydroxymethyl)oxan-3-yl]urea). $C_8H_{15}N_3O_7$. Any substance that is able to form covalent bonds and attach alkyl groups to nitrogen and oxygen atoms of the DNA bases and to other macromolecules.

Hazard: Highly reactive; carcinogen; mutagen; cytotoxic; immunotoxic; fetotoxic; teratogenic; abortifacient.

Use: An antineoplastic agent and to induce diabetes in experimental animals.

alkylation. (1) The introduction of an alkyl radical into an organic molecule. This was one of the early chemical processes used in Germany to furnish intermediates for improved dyes, e.g., dimethylaniline. Other alkylation products are cumene, dodecylbenzene, ethylbenzene, and nonylphenol. (2) A process whereby a high-octane blending component for gasolines is derived from catalytic combination of an isoparaffin and an olefin.

See alkylate (2); neohexane.

alkylbenzene. A compound that contains an alkyl group bonded to a benzene ring.

ALKYLBENZENE SULFONATE

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alkylbenzene sulfonate. (ABS). A branched-chain sulfonate type of synthetic detergent, usually a dodecylbenzene or tridecylbenzene sulfonate. Such compounds are known as "hard" detergents because of their resistance to breakdown by microorganisms. They are being replaced by linear sulfonates.

See alkyl sulfonate; linear molecule; detergent; sodium dodecylbenzene sulfonate.

alkyl carbonyl. A carbonyl in which a metal atom is bonded to an aromatic group and coordinated with several carbon monoxide molecules.

alkyl diaryl phosphate ester. See "Santicizer 141" [*Ferro*].

alkyldimethylbenzylammonium chloride. General name for a quaternary detergent. See benzalkonium chloride.

alkylene. A phosphated long-chain alcohol.

alkyl fluorophosphate. See diisopropyl fluorophosphate.

alkyl halide. (alkyl organohalide). Any organohalide in which one or more halogen atoms is substituted for hydrogen in an alkyl group.

Hazard: Central nervous system depressant; toxic.

alkylidene. Any compound of the alkylidene group.

alkylolamine. See alkanolamine.

alkyl polyamine. An amine in which two or more amino groups are bonded to alkane moieties.

Use: Chelating agents; industrial solvents; emulsifiers; epoxy resin hardeners; stabilizers; starting materials for dye synthesis.

alkyl sulfonate. (linear alkylate sulfonate; LAS). A straight-chain alkylbenzene sulfonate, a detergent specially tailored for biodegradability. The linear alkylates may be normal or iso (branched at the end only), but are C₁₀ or longer. See sodium dodecylbenzene sulfonate.

alkyne. See acetylene hydrocarbon.

all-trans-anhydroretinol.

CAS: 1224-78-8. C₂₀H₂₈.

Hazard: A reproductive hazard.

Allan-Robinson reaction. Preparation of flavones or isoflavones by condensing *o*-hydroxyaryl ketones with anhydrides of aromatic acids and their sodium salts.

allantoin. (glyoxyldiureide; 5-ureidohydantoin). C₄H₆N₄O₃. The end product of purine metabolism in mammals other than humans and other primates; it results from the oxidation of uric acid.

Properties: White to colorless powder or crystals; odorless; tasteless. Mp 230C (decomposes). 1 g is soluble in 190 cc water or 500 cc alcohol; readily soluble in alkalies. Optically active forms are known.

Derivation: Produced by oxidation of uric acid. Also present in tobacco seeds, sugar beets, wheat sprouts.

Use: Biochemical research, medicine.

allele. One of two or more types of genes that may occur at a given position on a strand of DNA.

allelochemical. A substance that inhibits the growth of animals and plants. See allelopathic chemical.

allelopathic chemical. Any of a wide range of natural herbicides of varying toxicity produced by many species of plants, as well as by soil microorganisms (bacteria, fungi). These compounds adversely affect other plants in the vicinity, either inhibiting germination and growth or killing them outright. They are extracted from the growing plant by leaching of its leaves, root exudates, and decomposition of dead tissue. Examples of plants found to be sources of these toxic compounds are sunflowers, oats, and soybeans. Among the products that have been identified are amygdalin, caffeine, gallic acid, and arbutin. Many types of chemical structures are represented. Research is directed toward breeding and cultivation of allelopathic plants to utilize their weed-killing ability.

allelotoxin. An allelopathic substance that has toxic effects on species other than that which produces the substance.

allene. (propadiene; dimethylenemethane; propa-1,2-diene). H₂C:C:CH₂.

CAS: 463-49-0. C₃H₄. Any hydrocarbon or hydrocarbon derivative produced by substitution that has two double bonds from one carbon and to two others.

Properties: Colorless gas. Unstable. Fp -136.5C, bp 34.5C. Can be readily liquefied.

Derivation: (1) Action of zinc dust on 2,3-dichloropropene; (2) pyrolysis of isobutylene; (3) electrolysis of potassium itaconate.

Use: Organic intermediate.

Allen-O'Hara furnace. A horizontal double-hearth furnace that is used for calcining sulfide ores.

allergen. Any substance that acts in the manner of an antigen on coming into contact with body tissues by inhalation, ingestion, or skin adsorption. The allergen causes a specific reagin to be formed in the bloodstream. The ability to produce reagins in response to a given allergen is an inherited characteristic that differentiates an allergic from a nonallergic person. A reagin is actually an antibody. The specificity of the allergen-reagin reaction and its dependence on molecular configuration are similar to those of an antigen-antibody reaction.

The allergen molecule (often a protein such as pollen or wool) may be regarded as a key that precisely fits the corresponding structural shape of the reagent molecule. Allergies in the form of contact dermatitis can result from exposure to a wide range of plant products, some metals, and a few organic chemicals. Though they are alike in some ways, antigen-antibody reactions protect the individual, whereas allergen-reagent reactions are harmful.

See antigen-antibody.

allergenic serum. A serum that induces hypersensitivity to antigen.

allethrin. $C_{19}H_{26}O_3$. Generic name for 2-allyl-4-hydroxycyclopenten-1-one ester of chrysanthemum monocarboxylic acid. A synthetic insecticide structurally similar to pyrethrin and used in the same manner. For other synthetic analogs, see barthrin, cyclethrin, ethythrins, furethrin. Pyrethrin I differs in having a 2,4-pentadienyl group in place of the allyl of allethrin.

Properties: Clear, amber-colored, viscous liquid. D 1.005–1.015 (20/20C), refr index (20C) 1.5040. Insoluble in water; incompatible with alkalies; soluble in alcohol, carbon tetrachloride, kerosene, and nitromethane. Combustible.

Derivation: Synthetically (glycerol, acetylene, and ethyl acetoacetate are the major raw materials).

Grade: 90%, technical (approximately 90% pure with 10% of isomers or related compounds), 20% technical, 2.5% technical.

Use: Insecticides, synergist.

allethrin I. (2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid 2-methyl-4-oxo-3-(2-propenyl)-2-cyclopenten-1-yl ester; allethron ester of chrysanthemum monocarboxylic acid; (2-methyl-4-oxo-3-prop-2-enylcyclopent-2-en-1-yl)2,2-dimethyl-3-(2-methylprop-1-enyl)cyclopropane-1-carboxylate). $C_{19}H_{26}O_3$. The commercial form of allethrin. Synthetic analog of the naturally occurring insecticides cinerin, jasmolin, and pyrethrin.

Hazard: Toxic.

Use: Insecticide.

allethrin II. (3-(3-methoxy-2-methyl-3-oxo-1-propenyl)-2,2-dimethylcyclopropane-carboxylic acid 2-methyl-4-oxo-3-(2-propenyl)-2-cyclopenten-1-yl ester; allenthrolone ester of chrysanthemum dicarboxylic acid monomethyl ester).

Properties: Oily, pale yellow mixture.

Hazard: Toxic.

Use: Insecticide.

allethrolone. (2-methyl-4-oxo-3-(2-propenyl)-2-cyclopentenol; 4-hydroxy-3-methyl-2-prop-2-enylcyclopent-2-en-1-one). $C_9H_{12}O_2$. An analog of pyrethrolone in which 2-propenyl replaces the 2,4-pentadienyl group.

Use: Synthesis of allethrin.

Allianz OPT. A polymer that makes sun screens water resistant.

allicin. $C_6H_{10}OS_2$. An antibacterial substance extracted from garlic (allium).

Properties: Yellow, oily liquid; sharp garlic odor. Unstable; decomposes rapidly when heated; slightly soluble in water; very soluble in alcohol, benzene, and ether.

Use: Medicine.

alldochlor. (2-chloro-*N,N*-di-2-propenylacetamide; α -chloro-*n,n*-diallylacetamide; *n,n*-diallyl-2-chloroacetamide; cdaa; 2-chloro-*N,N*-di(prop-2-enyl)acetamide).

CAS: 93-71-0. $C_8H_{12}ClNO$. An amide that modifies RNA and protein biosynthesis and inhibits cell division in primary meristems.

Hazard: Toxic.

Use: Pre-emergent herbicide.

alligatoring. Formation of cracks on the surface of thick paint layers, the underlying material remaining soft.

allo- A prefix designating the more stable of two geometrical isomers.

allochromatic. (1) Term used to refer to minerals whose color is a result of minute inclusions. (2) Term referring to crystals exhibiting photoconductivity.

allogenic. Variation in alleles among members of the same species.

allolactose. (6-[(3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-yl)oxymethyl]oxane-2,3,4,5-tetrol).

CAS: 585-99-9. $C_{12}H_{22}O_{11}$. A disaccharide consisting of two glucose units in an alpha (1-6) glycosidic linkage. It is an effector molecule that permits activation of the lac operon by binding to the repressor molecule.

Derivation: Occurs in milk.

allomaleic acid. See fumaric acid.

allomeric. Having the same crystal form but different chemical composition.

allomerism. A constancy of crystalline form or structure with a variation in chemical composition. See polyallomer.

allomorphism. A physical change in a mineral without the gain or loss of components.

alloocimene. (2,6-dimethyl-2,4,6-octatriene). $(CH_3)_2C(CH_3)CCH_3CHCH_3$.

Properties: Clear, almost colorless liquid. Boiling range (5–95%) 89–91C (20 mm), d 0.824 (15/15C), refr index 1.5278 (20C). Polymerizes and oxidizes readily. Combustible.

ALLOPHANAMIDE

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Derivation: Pyrolysis of α -pinene.

Use: Component of varnishes and a variety of polymers; fragrance.

allophanamide. See biuret.

allophanate. An unsaturated nitrogenous product made by reaction of an alcohol with two moles of isocyanic acid (a gas). Usually crystals, high-melting products that are easily isolated. Acid-sensitive and tertiary alcohols can be converted into allophanates.

Δ -allose. (β -*D*-allopyranose). $C_6H_{12}O_6$.

Properties: Crystals. Mp 128C, mw 180.16. Soluble in water, insoluble in alcohol.

Derivation: Obtained from the leaves of *Protea rubropilosa*.

all-purpose cleaner. Any of the numerous irritant formulations used in the home or the work place for general cleaning surface.

Properties: May contain ammonia water, artificial dyes, detergents, and/or fragrances.

Hazard: Toxic.

allosteric activator. Any molecule which positively modulates the activity of an allosteric enzyme.

allosteric enzyme. A regulatory enzyme, with catalytic activity modulated by the noncovalent binding of a specific molecule at a site other than the active site.

allosteric site. The specific site on the surface of an allosteric enzyme molecule (distinct from the active site) to which a modulator molecule binds.

allothreonine. See threonine.

allotrope. One of the several possible forms of a substance.
See allotropy.

allotropy. (polymorphism). The existence of a substance in two or more forms which are significantly different in physical or chemical properties. The difference between the forms involves either (1) crystalline structure; (2) the number of atoms in the molecule of a gas; or (3) the molecular structure of a liquid. Carbon is a common example of (1), occurring in several crystal forms (diamond, carbon black, graphite) as well as several amorphous forms. Diatomic oxygen and triatomic ozone are instances of (2); and liquid sulfur and helium of (3). Uranium has three crystalline forms, manganese four, and plutonium no less than six. A number of other metals also have several allotropic forms which are often designated by Greek letters, e.g., α -, γ -, and Δ -iron.

allouzarigenin. See 17- α -uzarigenin.

alloxan. (mesoxalylurea). $C_4H_2O_4N_2 \cdot H_2O$ and $4H_2O$.

Properties: White crystals, become pink on exposure to air; colorless aqueous solution which imparts pink color to skin. Mp 170C (decomposes) (various melting points in literature). Soluble in water and alcohol.

Derivation: Oxidation of uric acid in acid solution.

Use: Biochemical research, cosmetics, organic synthesis.

alloxan hydrate. See 5,5-dihydroxy barbituric acid.

alloy. A solid or liquid mixture of two or more metals, or of one or more metals with certain non-metallic elements, as in carbon steels. The properties of alloys are often greatly different from those of the components. The purpose of an alloy is to improve the specific usefulness of the primary component—not to adulterate or degrade it. Gold is too soft to use without a small percentage of copper. The corrosion and oxidation resistance of steel is markedly increased by incorporation of 15–18% of chromium and often a few percent of nickel (stainless steel). The presence of up to 1.5% carbon profoundly affects the properties of steels. Similarly, a low percentage of molybdenum improves the toughness and wear resistance of steel. The hundreds of special alloys available are the results of designs to meet specific operating conditions. Amorphous alloys for use in transformer coils are made by quick-quenching the melt.

See alloy, fusible; amalgam; superalloy.

alloy, fusible. (low-melting alloy; fusible metal). An alloy melting in the range of approximately 51–260C, usually containing bismuth, lead, tin, cadmium, or indium. Eutectic alloys are the particular compositions that have definite and minimum melting points compared. The compositions of a few fusible alloys are given below:

System	Eutectic Composition	Temperature (C)
Cd-Bi	60 Bi-40 Cd	144
In-Bi	33.7 Bi-66.3 In	72
	67.0 Bi-33 In	109
Pb-Bi	56.5 Bi-43.5 Pb	125
Sn-Bi	58 Bi-42 Sn	139
Pb-Sn-Bi	52 Bi-16 Sn-32 Pb	96
Pb-Cd-Bi	52 Bi-8 Cd-40 Pb	92
Sn-Cd-Bi	54 Bi-20 Cd-26 Sn	102
In-Sn-Bi	58 Bi-17 Sn-25 In	79
Pb-Sn-Cd-Bi	*50 Bi-10 Cd-13.3 Sn-26.7 Pb	70
In-Pb-Sn-Bi	49.4 Bi-11.6 Sn-18 Pb-21 In	57
In-Cd-Pb-Sn-Bi	44.7 Bi-5.3 Cd-8.3 Sn-22.6 Pb-19.1 In	47

*Wood's metal.

alloy steel. A steel containing up to 10% of elements such as chromium, molybdenum, nickel, etc., usually with a low percentage of carbon. These added elements improve hardenability, wear resistance, toughness, and other properties. This term includes low-alloy steels in which the alloy content does not exceed 5%, but does not include stainless steel.

See steel.

allyl acetate. (acetic acid allyl ester; acetic acid-2-propenyl ester; 3-acetoxypropene; prop-2-enyl acetate).

CAS: 591-87-7. $C_5H_8O_2$.

Properties: Flammable; water insoluble liquid.

Hazard: Skin and eye irritant; poisonous.

allylacetone. (5-hexene-2-one).

$CH_2CHCH_2CH_2COCH_3$.

Properties: Colorless liquid. D 0.846 (20/4C), bulk d 6.99 lb/gal (20C), 5–95% distills between 127–129C. Soluble in water and organic solvents.

Use: Intermediate in pharmaceutical synthesis, perfumes, fungicides, insecticides, fine chemicals.

allyl acrylate. $CH_2CHCOOCH_2CHCH_2$. Liquid, bp 122–134C. Used as monomer for resins.

allyl alcohol. (2-propen-1-ol; propenyl alcohol). CAS: 107-18-6. $CH_2=CH_2OH$.

Properties: Colorless liquid; pungent mustardlike odor. Bp 96.9C, mp –129C, d 0.8520 (20/4C), bulk d 7.11 lb/gal (20C), refr index 1.4131, flash p 70F (21C) (TOC), autoign temp 713F (375C). Miscible with water, alcohol, chloroform, ether.

Derivation: (1) Hydrolysis of allyl chloride (from propylene) with dilute caustic, (2) isomerization of propylene oxide over lithium phosphate catalyst at 230–270C, (3) dehydration of propylene glycol.

Hazard: Toxic by skin absorption. Eye and upper respiratory tract irritant. Questionable carcinogen.

Use: Esters for use in resins and plasticizers, intermediate for pharmaceuticals and other organic chemicals, manufacture of glycerol and acrolein, military poison, herbicide.

allylamine. (2-propenylamine). $C_3H_5NH_2$.

Properties: Colorless to light-yellow liquid; strong ammoniacal odor. Attacks rubber and cork. Bp 55–58C, d 0.759–0.761 (20/20C), refr index 1.4194 (22C). Soluble in water, alcohol, ether, and chloroform. Combustible.

Grade: CP, technical.

Use: Pharmaceutical intermediate, organic synthesis.

allyl bromide. (3-bromopropene; bromoallylene).

CAS: 106-95-6. $H_2C=CHCH_2Br$.

Properties: Colorless to light-yellow liquid; irritating, unpleasant odor. D 1.398 (20/4C), mp –199C; bp 71.3C, refr index 1.4654, flash p 30F (–1.1C), autoign temp 563F (295C). Soluble in alcohol, ether, chloroform, carbon tetrachloride, carbon disulfide; insoluble in water.

Grade: Technically pure (95% min purity via bromium titration).

Hazard: Strong irritant to skin and eyes, flammable, high fire risk. Upper respiratory tract irritant. Questionable carcinogen.

Use: Organic syntheses, preparation of resins, perfume intermediates.

allyl carbamate.

Use: Intermediate for fireproofing compound, emulsion, and solvent polymers.

allyl chloride.

CAS: 107-05-1. $H_2C=CHCH_2Cl$.

Properties: Colorless liquid with a disagreeable pungent odor. D 0.938 at 20C, mw 76.53, vap press 295 at 20C, flash p –25F (CC). Slightly soluble in water; miscible with alcohol, chloroform, ether, and petroleum ether.

Hazard: Skin and eye irritant. Upper respiratory tract irritant, liver and kidney damage. Questionable carcinogen.

Use: Synthesis of allyl compounds.

allyl diglycol carbonate. See diethylene glycol bis(allyl carbonate).

4-allyl-1,2-dimethoxybenzene. See methyl eugenol.

allylene. See methylacetylene.

2-allyl-2-ethyl-1,3-propanediol.

$C_3H_5C(CH_2OH)_2CH_2CH_3$.

Properties: Off-white solid. Fp 31C, d 0.976 (35C).

Use: Suggested as polymer additive and chemical intermediate.

allyl glycidyl ether. (AGE).

CAS: 106-92-3.

Properties: Colorless liquid of pleasant odor. D 0.9698 at 20C, mw 114, fp –100C, bp 153.9C (760 mm), vap press 4.7 mm at 25C, flash p 135F (OC). Slightly soluble in water.

Hazard: Skin, eye, and upper respiratory tract irritant, and dermatitis. Questionable carcinogen.

Use: Resin intermediate, stabilizer of chlorinated compounds, vinyl resins, and rubber.

1-allyl-4-hydroxybenzene. See chavicol.

allylic rearrangements. Migration of a C=C double bond in a three-carbon (allylic) system on treatment with nucleophiles under S_N1 conditions (or under S_N2 conditions when the nucleophilic attack takes place at the γ -carbon).

allyl- α -ionone. $C_{16}H_{24}O$. Yellow liquid with fruity odor. D 0.928–0.935 (25/25C). Stable, soluble in 70% alcohol. Made synthetically.

Properties: Combustible.

Use: A perfume and flavoring.

5-ALLYL-5-ISOBUTYLBARBITURIC ACID 50

5-allyl-5-isobutylbarbituric acid. $C_{11}H_{16}N_2O_3$.

Properties: White, crystalline powder; odorless; slightly bitter taste. Mp 138–139C. Soluble in alcohol, ether, and chloroform; almost insoluble in water.

Use: Medicine (sedative).
See barbiturate.

allyl isocyanate. C_3H_5NCO .

Properties: Colorless liquid, turns yellow on standing. D 0.935–0.945 (20C), flash p 110F (43.3C), bp 85.5–86C, fp less than –80C. Combustible.

Grade: Purity, 98% min.

Hazard: Moderate fire risk. Toxic.

Use: Organic intermediate, cross-linking agent, polymer modifier.

allylisopropylacetamide. An amide that initiates autoxidation, destroying microsomal cytochromes, especially cytochrome P-450.

allyl isothiocyanate. (allyl isosulfocyanate; mustard oil; 2-propenyl isothiocyanate).

CAS: 57-06-7. $H_2C=CHCH_2NCS$.

Properties: Colorless to pale yellow, oily liquid; pungent, irritating odor; sharp, biting taste. D 1.013–1.016 (25C), bp 152C, flash p 115F (46.1C), refr index 1.527; optically inactive. Soluble in alcohol, ether, carbon disulfide; slightly soluble in water. Combustible.

Derivation: Distillation of sodium thiocyanate and allyl chloride, or of seed of black mustard.

Grade: Technical, FCC.

Hazard: Toxic via ingestion, inhalation, skin contact; fire risk. Questionable carcinogen.

Use: Fumigant, ointments, and mustard plasters.

allyl isovalerate. (isovaleric acid, allyl ester; allyl isovalerianate; allyl 3-methylbutyrate; 3-methylbutanoic acid, 2-propenyl ester; 3-methylbutyric acid, allyl ester; 2-propenyl isovalerate; 2-propenyl 3-methylbutanoate).

CAS: 2835-39-4.

Properties: Organic compound.

Hazard: Toxic, irritant, questionable carcinogen.

allyl mercaptan. See allyl thiol.

allyl methacrylate. $CH_2C(CH_3)COOC_3H_5$.

Use: As monomer and intermediate.

4-allyl-2-methoxyphenol. See eugenol.

4-allyl-1,2-methylenedioxybenzene. See safrole.

2-(3-allyloxyphenyl)imidazo(2,1-a)isoquinoline.

CAS: 61001-16-9. $C_{20}H_{16}N_2O$.

Hazard: A reproductive hazard.

allyl pelargonate. $C_3H_5OOC(CH_2)_7CH_3$.

Properties: Liquid, fruity odor, bp 87–91C (3 mm), refr index 1.4332 (20.5C). Combustible.

Use: Flavors and perfumes, polymers.

2-allylpentanoic acid.

CAS: 1575-72-0. $C_8H_{14}O_2$.

Hazard: Moderately toxic.

p-allylphenol. See chavicol.

allyl phosphite. See phosphorous acid, triallyl ester.

allyl propyl disulfide.

CAS: 2179-59-1. $CH_2=CHCH_2S_2C_3H_7$.

Properties: Liquid with a pungent, irritating odor. Mw 148.16, d 0.9289 at 15C. Soluble in ether, carbon disulfide, and chloroform.

Derivation: The chief volatile constituent of onion oil.

Hazard: Eye and upper respiratory tract irritant.

allyl resin. A special class of polyester resins derived from esters of allyl alcohol and dibasic acids. Common monomers are allyl diglycol carbonate, also known as diethylene glycol bis(allyl carbonate), diallyl chlorendate, diallyl phthalate, diallyl isophthalate, and diallyl maleate. Polymerization occurs through the unsaturated allyl double bond to form thermosetting resins that are highly resistant to chemicals, moisture, abrasion, and heat, and have low shrinkage and good electrical resistivity.

Use: As laminating adhesives and coatings, especially by impregnation of layered materials with prepolymers (called prepregs); allylic glass cloth, varnishes, applications requiring microwave transparency, encapsulation of electronic parts, vacuum impregnation of metal, casting of ceramics, molding compositions, heat-resistant furniture finishes.

allyl sulfide. (diallyl sulfide; thioallyl ether). $(CH_2CHCH_2)_2S$.

Properties: Colorless liquid with garlic odor. Bp 139C, d 0.888 (27/4C), refr index 1.4877 (27C). Insoluble in water; miscible with alcohol, ether, chloroform, and carbon tetrachloride. Combustible.

Use: Component of artificial oil of garlic.

allyl thiol. (allyl mercaptan; 2-propene-1-thiol). CH_2CHCH_2SH .

Properties: Water-white liquid (darkens on standing); strong garlic odor. D 0.925 (23/4C), bp 90C. Insoluble in water; soluble in ether and alcohol. Combustible.

Use: Pharmaceutical intermediate, rubber accelerator intermediate.

allylthiourea. (allylsulfocarbamide; thiosinamine; allyl sulfourea). $C_3N_5NHCSNH_2$.

Properties: White, crystalline solid; slight garlic odor; bitter taste. D 1.22; mp 78C. Soluble in water, ether, and solutions of borax, benzoates, urethane; insoluble in benzene; slightly soluble in 70% alcohol.

Derivation: Warming a mixture of equal parts of allyl isothiocyanate and absolute alcohol with an equal amount of 30% ammonia.

Use: Medicine, corrosion inhibitor, organic synthesis.

allyltrichlorosilane. $\text{CH}_2\text{CHCH}_2\text{SiCl}_3$.

Properties: Colorless liquid; pungent, irritating odor. Bp 117.5C; d 1.217 (27C); refr index 1.487 (20C); flash p 95F (35C) (COC). Readily hydrolyzed by moisture with the liberation of hydrochloric acid, polymerizes easily. Fire hazard.

Derivation: Reaction of allyl chloride with silicon (copper catalyst).

Use: Intermediate for silicones, fibrous glass finishes.

allyltriphenyl stannane. See allyltriphenyltin.

allyltriphenyltin.

CAS: 76-63-1. $\text{C}_{21}\text{H}_{20}\text{Sn}$.

Properties: Needle-like crystals from alc. Mp: 73–74.5C. Sol in most org solvs.

Hazard: A poison.

4-allyl veratrole. See methyl eugenol.

almond emulsion. (synaptase; amygdalase; β -glucosidase). An enzyme catalyzing the production of glucose from β -glucosides.

Properties: White powder; odorless; tasteless. Capable of hydrolyzing glucosides such as amygdalin to glucose and the other component substances. Soluble in water; insoluble in ether and alcohol.

Source: Sweet almonds.

Derivation: By extracting an emulsion of almonds with ether, filtering the clear solution, and precipitating the emulsion with alcohol.

Use: Food grade flavoring.

almond oil. The volatile essential oil distilled from ground kernels of bitter almonds.

Use: Cosmetic creams, perfumes, liqueurs, food flavors (hydrocyanic acid-free).

See amygdalin.

Note: "Bitter almonds contain amygdalin together with an enzyme that catalyzes its hydrolysis. When the kernels are ground and moistened, a volatile oil produced by the hydrolysis can be distilled from them consisting mainly of benzaldehyde and hydrocyanic acid. This is the oil of bitter almond used in pharmacy as a food flavor after removal of the hydrocyanic acid" (Eckey, *Vegetable Fats and Oils*).

alnico. Coined word for an alloy containing chiefly iron, aluminum, nickel, and cobalt which has outstanding properties as a permanent magnet.

aloe-emodin. (1,8-dihydroxy-3-(hydroxymethyl)-9,10-anthracenedione; 1,8-dihydroxy-3-(hydroxymethyl)anthraquinone; 3-hydroxymethylchrysin; bitter aloe; rhabarberone; 1,8-dihydroxy-3-(hydroxymethyl)anthracene-9,10-dione). $\text{C}_{15}\text{H}_{10}\text{O}_5$. A cathartic anthraquinoid that occurs free and as a glycoside.

Derivation: In the leaves of rhubarb, senna and certain species of *Aloe (lilaceae)*.

aloin. (barbaloin). A mixture of active principles obtained from aloe. Varies in properties according to variety used.

Properties: Yellow crystals; bitter taste; no or slight odor of aloe. Darkens on exposure to air. Approx 60% soluble in pyridine; slightly soluble in water and organic solvents.

Grade: Technical.

Use: Medicine, proprietary laxatives, electroplating baths, fermentation.

alpaca. A natural fiber obtained from a South American animal similar to the llama. Properties resemble those of wool. Used for specialty clothing and also blended with polyester. Combustible.

Alpha. Olefin (polypropylene) fiber.

Use: Automotive, home furnishings, and apparel.

alpha. (α). (1) A prefix denoting the position of a substituting atom or group in an organic compound. The Greek letters α , β , γ , etc., are usually not identical with the IUPAC numbering system 1, 2, 3, etc., since they do not start from the same carbon atom. However, α and β are used with naphthalene ring compounds to show the 1 and 2 positions, respectively. α , β , etc., are also used to designate attachment to the side chain of a ring compound. (2) Both a symbol and a term used for relative volatility in distillation. (3) Symbol for optical rotation. (4) A form of radiation consisting of helium nuclei. See alpha particle. (5) The major allotropic form of a substance, especially of metals, e.g., α -iron.

alpha-cellulose. See cellulose; α -cellulose.

Alpha helix. A helical conformation of a polypeptide chain, predominantly right-handed, with maximal intrachain hydrogen bonding of the peptide bonds; one of the most common secondary structures in proteins.

alpha-hydroxy acids. See: α -hydroxy acids.

alpha particle. (α particle). A helium nucleus emitted spontaneously from radioactive elements both natural and manufactured. Its energy is in the range of 4–8 MeV and is dissipated in a very short path, i.e., in a few centimeters of air or less than 0.005 mm of aluminum. It has the same mass (4) and positive charge (2) as the helium nucleus.

ALPHA SAN

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Accelerated in a cyclotron alpha-particles can be used to bombard the nuclei of other elements. See helium; decay; radioactive.

Alpha San. A nylon carpet yarn, polyamide 6 for hospital, child care, and office locations.
Use: Antimicrobial.

Alrok process. The immersion of aluminum-base metals in a hot solution of alkali carbonate and chromate in order to form a corrosion-resistant oxide film on the surface.

Alsilox. A fusion product of 1% alumina, 65% litharge, and 34% silica, used in ceramics. Available in various particle sizes.

Alternaria. A genus of fungi, at least some species of which are allergens and frequently infest laboratories. It is a common fungus commonly known as "black rot" on tomato fruit. *Alternaria* species is known as opportunistic pathogens in immunocompromised individuals.

Hazard: Pathogenic.

alternaric acid. An acid that is a withering agent that wilts the leaves of solanaceous plants at concentrations as low as 5 µg/ml.

Derivation: Occurs in the fungus, *Alteraria solani*.

alternating polymer. Polymer in which the molecules of different monomers alternate in the chain.

alternative splicing. Different ways of combining a gene's exons to make variants of the complete protein.

altheine. See asparagine.

Altman, Sidney. (1939–). Awarded Nobel Prize in chemistry in 1989 jointly with Cech for the discovery that RNA acts as a biological catalyst as well as a carrier of genetic information. Doctorate in 1967 from the University of Colorado.

altretamine. (2-*N*,2-*N*,4-*N*,4-*N*,6-*N*,6-*N*-hexamethyl-1,3,5-triazine-2,4,6-triamine). CAS: 645-05-6. C₉H₁₈N₆. A hexamethyl-2,4,6-triamine derivative of 1,3,5-triazine.

Use: Antineoplastic alkylating agent and insect chemosterilant.

Hazards: Toxic.

altrose. An aldohexose that is isomeric with glucose, tallose, allose, and others.

alugan. See bromomethylhexachlorobicycloheptene.

alum. See aluminum ammonium sulfate; aluminum potassium sulfate, aluminum sulfate.

alum, burnt. (alum, dried). AlK(SO₄)₂. Aluminum ammonium sulfate or aluminum potassium sulfate heated just sufficiently to drive off the water of crystallization.

Properties: White, odorless powder; sweetish taste. Absorbs moisture on exposure to air. Soluble in hot water; slowly soluble in cold water; insoluble in alcohol.

Use: Medicine (astringent).

alum, chrome. See chromium potassium sulfate.

alum, chrome ammonium. See chromium ammonium sulfate.

alum-hematoxylin. A purple nuclear histological stain that is a mixture of an aqueous solution of ammonium alum and an alcoholic solution of aged hematoxylin.

alumina. See aluminum oxide and following entries.

alumina, activated. A highly porous, granular form of aluminum oxide having preferential adsorptive capacity for moisture and odor contained in gases and some liquids. When saturated, it can be regenerated by heat (176–315C). The cycle of adsorption and reactivation can be repeated many times. Granules range in size from powder (7 microns for chromatographic work) to pieces approximately 1.5 inches in diameter. Average density approximately 50 lb/cu ft.

Use: An effective desiccant for gases and vapors in the petroleum industry. It is also used as a catalyst or catalyst carrier in chromatography, and in water purification.

See aluminum oxide.

alumina, fused. See aluminum oxide.

alumina gel. See aluminum hydroxide gel.

alumina-silica fiber.

Properties: Amorphous structure, excellent resistance to all chemicals except hydrochloric and phosphoric acids and concentrated alkalis. Available in both short and long staple. Low heat conductivity, high thermal shock resistance. Tensile strength 400,000 psi, elastic modulus 16 million psi, upper temperature limit in oxidizing atmosphere 800C. Noncombustible.

Derivation: The short fiber type is made by blasting a stream of molten alumina and silica with a steam jet. Long staple is spun from a molten mixture of alumina and silica modified with zirconium.

Available forms: Fibers, sheets, blankets.

Use: Nonwoven fabrics (short staple), woven fabric structures, cordage, thermal insulation, repair of furnace linings, piping molten metals, welding insulation (reusable), insulation for rocket and space applications.

Note: In finely divided form, alumina-silica is also used as a catalyst.

alumina trihydrate. (aluminum hydroxide; aluminum hydrate; hydrated alumina; hydrated aluminum oxide).

CAS: 21645-51-2. $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ or $\text{Al}(\text{OH})_3$.

Properties: White crystalline powder, balls, or granules. D 2.42. Insoluble in water; soluble in mineral acids and caustic soda. Releases water on heating.

Derivation: From bauxite. The ore is dissolved in strong caustic and aluminum hydroxide precipitated from the sodium aluminate solution by neutralization (as with carbon dioxide) or by autprecipitation (Bayer process).

Grade: Technical, CP.

Use: Glass, ceramics, iron-free aluminum and aluminum salts, manufacture of activated alumina, base for organic lakes, flame retardants, mattress batting. Finely divided form (0.1–0.6 microns) used for rubber reinforcing agent, paper coating, filler, cosmetics.

aluminium. British spelling of aluminum.

aluminon. (aurine tricarboxylic acid, ammonium salt).

Properties: Mw 473.44, mp 220.5C (decomposes).

Use: As a reagent for aluminum in solution.

aluminosilicate. A compound of aluminum silicate with metal oxides or other radicals.

Use: Catalyst in refining petroleum, to soften water, and in detergents. The sodium compound, $\text{Na}_{12}[(\text{AlO}_2)_{12}(\text{SiO}_2)_{12}]_x\text{H}_2\text{O}$, is typical. See zeolite; molecular sieve.

aluminum. (Al; aluminium).

CAS: 7429-90-5. Metallic element of atomic number 13; group IIIA of the periodic table; aw 26.98154; valence 3; no stable isotopes. Monovalent in high-temperature compounds (AlCl and AlF). Most abundant metal in earth's crust; third most abundant of all elements. Does not occur free in nature.

Properties: Silvery white, crystalline solid. Tensile strength (annealed) 6800 psi, cold-rolled 16,000 psi. D 2.708, mp 660C, bp 2450C. Forms protective coating of aluminum oxide approximately 50 Å thick, which makes it highly resistant to ordinary corrosion. Attacked by concentrated and dilute solutions of hydrochloric acid, hot concentrated sulfuric acid, and perchloric acid. Also violently attacked by strong alkalis. Rapidly oxidized by water at 180C. Not attacked by dilute or cold concentrated sulfuric acid or concentrated nitric acid. Can ignite violently in powder form. Electrical conductivity approximately two-thirds that of copper. Aluminum qualifies as both a light metal and a heavy metal, according to their definitions.

Derivation: From bauxite by Bayer process and subsequent electrolytic reduction by Hall process. There are several processes for obtaining ultrapure aluminum: (1) electrolytic (three-layer), (2) zone refining, and (3) chemical refining. Impurities as low as 0.2 ppm are possible.

More efficient processes are the Alcoa and Toth processes which require much less electric power than

the Hall process. Another method, using no electricity, involves heating a mixture of aluminum ores with a coal-derived fuel in a closed furnace. Still another process called calssintering, using fly ash as a source of alumina, has been described (1978). See calssintering.

Available forms: Structural shapes of all types, plates, rods, wire foil flakes, powder (technical and USP). Aluminum can be electrolytically coated and dyed by the anodizing process (see anodic coating); it can be foamed by incorporating zirconium hydride in molten aluminum, and it is often alloyed with other metals or mechanically combined (fused or bonded) with boron and sapphire fibers or whiskers. Strengths up to 55,000 psi at 500C have been obtained in such composites. A vapor-deposition technique is used to form a tightly adherent coating from 0.2 to 1 mil thick on titanium and steel.

Hazard: Fine powder forms flammable and explosive mixtures in air. Confirmed carcinogen.

Use: Building and construction, corrosion-resistant chemical equipment (desalination plants), die-cast auto parts, electrical industry (power transmission lines), photoengraving plates, permanent magnets, cryogenic technology, machinery and accessory equipment, miscible food-processing equipment, tubes for ointments, toothpaste, shaving cream, etc. Also as a powder in paints and protective coatings, as rocket fuel, as an ingredient of incendiary mixtures (thermite) and pyrotechnic devices, as a catalyst, and for foamed concrete vacuum metallizing and coating. Other uses are as foil in packaging, cooking, and decorative stamping, and as flakes for insulation of liquid fuels.

See aluminum alloy.

aluminum acetate. A salt obtained by reaction of aluminum hydroxide and acetic acid with subsequent recrystallization. Its neutral form $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_3$ is a white, water-soluble powder used in solution as an antiseptic, astringent, and antiperspirant. Its basic form is $\text{Al}(\text{C}_2\text{H}_3\text{O}_2)_2\text{OH}$, also known as aluminum diacetate and aluminum subacetate. It is a crystalline solid, insoluble in water, used as a mordant in textile dyeing, as a flame retardant and waterproofing agent, and in manufacture of lakes and pigments.

See mordant rouge.

aluminum acetylacetonate. $\text{Al}(\text{C}_5\text{H}_7\text{O}_2)_3$.

Properties: Solid. Mp 189C, bp 315C. Soluble in benzene and alcohol.

Use: Deposition of aluminum, catalyst.

aluminum alkyl. (Al trialkyl). Catalyst used in the Ziegler process.

Hazard: Pyrophoric liquid.

See triethylaluminum; triisobutylaluminum.

aluminum alloy. Aluminum containing variable amounts of manganese, silicon, copper, magnesium, lead, bismuth, nickel, chromium, zinc,

ALUMINUM AMMONIUM CHLORIDE 54

or tin. A wide range of uses and properties is possible. Alloys may be obtained for casting or working, heat-treatable or nonheat-treatable, with a wide range of strength, corrosion resistance, machinability, and weldability. See duralumin.

aluminum ammonium chloride. (ammonium aluminum chloride). $\text{AlCl}_3 \cdot \text{NH}_4\text{Cl}$.

Properties: White crystals. Mp 304C. Soluble in water.

Use: Fur treatment.

aluminum ammonium sulfate. (ammonium alum; alum NF). $\text{Al}_2(\text{SO}_4)_3(\text{NH}_4)_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$ or $\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Properties: Colorless crystals; odorless; strong astringent taste. D 1.645, mp 94.5C, bp loses 20 waters at 120C. Soluble in water and glycerol; insoluble in alcohol.

Derivation: By crystallization from a mixture of ammonium and aluminum sulfates.

Method of purification: Recrystallization.

Grade: Technical, lump, ground, powdered, CP, NF, FCC.

Use: Mordant in dyeing, water and sewage purification, sizing paper, retanning leather, clarifying agent, food additive, manufacture of lakes and pigments, and fur treatment.

aluminum, anodized. See anodic coating.

aluminum antimonide. AlSb.

Properties: Crystalline solid. Mp 1050C.

Derivation: Fusion of the elements followed by zone refining to purify.

Use: Semiconductor technology.

aluminum arsenide. AlAs. A semiconductor used in rectifiers, transistors, thermistors.

Hazard: Poisonous by ingestion.

aluminum borate. $\text{Al}_2\text{O}_3 \cdot \text{B}_2\text{O}_3$.

Properties: White, granular powder; decomposed by water.

Derivation: Interaction of aluminum hydroxide and boric oxide.

Grade: Technical, CP.

Use: Glass and ceramic industries, polymerization catalyst.

aluminum boride.

Properties: Powder. Apparent bulk density, (fully settled, light) 0.6–0.8 g/cc; dense, 1.2–1.4 g/cc; high neutron absorption.

Use: Nuclear shielding.

aluminum borohydride. $\text{Al}(\text{BH}_4)_3$.

Properties: Volatile, pyrophoric liquid. Bp 44.5C; fp –64.5C.

Derivation: (1) By reaction of sodium borohydride and aluminum chloride in the presence of a small

amount of tributyl phosphate; (2) by reaction of trimethylaluminum and diborane.

Hazard: Ignites spontaneously in air, reacts violently with water.

Use: Intermediate in organic synthesis, jet fuel additive, reducing agent.

aluminum brass. An alloy containing 76% copper, 21.5–22.25% zinc, and 1.75–2.50% aluminum.

Use: Condenser, evaporator, and heat exchanger tubes and ferrules.

aluminum bromide. (1) AlBr_3 ; (2) $\text{AlBr}_3 \cdot 6\text{H}_2\text{O}$.

Properties: White to yellowish, deliquescent crystals. Exists as double molecules Al_2Br_6 in the vapor. (1) D 3.01, mp 97.5C, bp 265C; (2) d 2.54, mp 93C (decomposes). Soluble in alcohol, carbon disulfide, or ether.

Derivation: (1) By passing bromine over heated aluminum; (2) reaction of hydrogen bromide with aluminum hydroxide.

Hazard: The anhydrous form reacts violently with water; corrosive to skin.

Use: Anhydrous: bromination, alkylation, and isomerization catalyst in organic synthesis.

aluminum bronze. An alloy containing 88–96.1% copper, 2.3–10.5% aluminum, and small amounts of iron and tin. Characterized by high strength, ductility, hardness, and resistance to shock, fatigue, most chemicals, and seawater.

Grade: Powder that is also called gold bronze powder. An alloy of 90% copper and 10% aluminum reduced from leaf form to powder, polished mechanically, and coated with stearic acid. Available in the following grades: litho, molding, printing-ink, and radiator.

Use: A pigment in paints and inks.

aluminum-*n*-butoxide. $\text{Al}(\text{OC}_3\text{H}_7)_3$.

Properties: Yellow to white crystalline solid. Mp 101.5C (pure) and 88–96C (commercial), d 1.0251 (20C), bp 290–310C (30 mm). Soluble in aromatic, aliphatic, and chlorinated hydrocarbons.

Use: Ester exchange catalyst, defoamer ingredient, hydrophobic agent, intermediate.

aluminum calcium hydride. (calcium aluminum hydride). Al_2CaH_8 .

Properties: Grayish solid. Soluble in tetrahydrofuran, insoluble in benzene.

Derivation: Reaction of AlCl_3 and CaH_2 in tetrahydrofuran.

Hazard: Flammable in contact with water and alcohols. Spontaneous ignition in moist air: store and handle in nitrogen.

Use: Versatile reducing agent.

aluminum calcium silicate.

Hazard: A nuisance dust.

Use: Food additive.

aluminum carbide. Al_4C_3 .

Properties: Yellow crystals or powder. D 2.36, stable to 1400C. Decomposes in water with liberation of methane.

Derivation: By heating aluminum oxide and coke in an electric furnace.

Grade: Technical.

Hazard: Dangerous fire risk in contact with moisture.

Use: Generating methane, catalyst, metallurgy, drying agent, reducing agent.

aluminum carbonate. A basic carbonate of variable composition; formula sometimes given as $\text{Al}_2\text{O}_3 \cdot \text{CO}_2$. White lumps or powder, insoluble in water; dissolves in hot hydrochloric acid or sulfuric acid. Formerly used as mild astringent, styptic. Normal aluminum carbonate $\text{Al}_2(\text{CO}_3)_3$ is not known as an individual compound.

aluminum chlorate. $\text{Al}(\text{ClO}_3)_3$.

Properties: Colorless crystals. Deliquescent; soluble in water and alcohol.

Hazard: Powerful oxidizing material: keep out of contact with combustibles.

Use: Disinfectant, color control of acrylic resins.

aluminum chloride, anhydrous. AlCl_3

Properties: White or yellowish crystals. D 2.44 (25C), mp 190C (2.5 atm), sublimes readily at 178C. The vapor consists of double molecules Al_2Cl_6 . Soluble in water.

Derivation: (1) By reaction of purified gaseous chlorine with molten aluminum; (2) by reaction of bauxite with coke and chlorine at approximately 875C. (This product is used to make the hydrate).

Impurities: Ferric chloride-free aluminum, insolubles.

Grade: Technical, reagent.

Hazard: Powerful irritant to tissue; moderately toxic by ingestion. Reacts violently with water, evolving hydrogen chloride gas.

Use: Ethylbenzene catalyst, dyestuff intermediate, detergent alkylate, ethyl chloride, pharmaceuticals and organics (Friedel-Crafts catalyst), butyl rubber, petroleum refining, hydrocarbon resins, nucleating agent for titanium dioxide pigments.

aluminum chloride hydrate. $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$.

Properties: White or yellowish, deliquescent, crystalline powder; nearly odorless; sweet astringent taste. D 2.4, mp (decomposes). Soluble in water and alcohol. The water solution is acid.

Derivation: By crystallizing the anhydrous form from hydrochloric acid solution.

Grade: Technical, CP, NF. Aluminum chloride solution 32°Bé is a special grade consisting of a solution containing only 0.005% iron as impurity, and having an acid reaction but containing no free acid.

Use: Pharmaceuticals and cosmetics (antiperspirants), pigments, roofing granules, special papers, photography, textiles (wool).

aluminum chlorohydrate. $[\text{Al}_2(\text{OH})_5\text{Cl}]_x$.

An ingredient of commercial antiperspirant and deodorant preparations. Also used for water purification and treatment of sewage and plant effluent.

aluminum cleaner. A cleaner that contains aluminum salts.

Hazards: Moderately toxic.

aluminum dextran. See aluminum monostearate.

aluminum diacetate. See aluminum acetate.

aluminum diethyl monochloride. See diethylaluminum chloride.

aluminum diformate. (aluminum formate, basic). $\text{Al}(\text{OH})(\text{CHO}_2)_2 \cdot \text{H}_2\text{O}$.

Properties: White or gray powder. Soluble in water.

Derivation: Aluminum hydroxide is dissolved in formic acid and spray-dried. Solutions are also prepared by treating aluminum sulfate with formic acid, followed by lime.

Grade: Technical, solutions (12–20° Bé).

Use: Waterproofing, mordanting, antiperspirants, tanning leather, improving wet strength of paper.

aluminum distearate.

CAS: 300-92-5. $\text{Al}(\text{OH})(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$.

Properties: White powder. Mp 145C, d 1.009. Insoluble in water, alcohol, ether. Forms gel with aliphatic and aromatic hydrocarbons.

Use: Thickener in paints, inks, and greases; water repellent; lubricant in plastics and cordage; and in cement production.

aluminum ethylate. (aluminum ethoxide). $\text{Al}(\text{OC}_2\text{H}_5)_3$.

Properties: Colorless liquid which gradually solidifies. Bp 200C (6 mm), mp 140C. Partly soluble in high-boiling organic solvents.

Derivation: Reaction of aluminum with ethanol, catalyzed by iodine and mercuric chloride.

Hazard: Strong irritant to eyes and skin.

Use: Reducing agent for aldehydes and ketones, polymerization catalyst.

aluminum ethylhexoate. (aluminum octoate).

A metallic salt of 2-ethylhexoic acid.

Use: A gelling agent for liquid hydrocarbons, and a paint additive.

aluminum fluoride, anhydrous. AlF_3 .

Properties: White crystals. Sublimes at approximately 1250C, d 2.882. Slightly soluble in water; insoluble in most organic solvents.

Derivation: (1) Action of hydrogen fluoride gas on alumina trihydrate; (2) reaction of hydrogen fluoride on a suspension of aluminum trihydrate, followed by calcining the hydrate formed; (3) reaction of fluosilicic acid on aluminum hydrate.

ALUMINUM FLUORIDE, HYDRATE

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Grade: Technical.

Hazard: Strong irritant to tissue.

Use: Production of aluminum to lower the melting point and increase the conductivity of the electrolyte, flux in ceramic glazes and enamels, manufacture of aluminum silicate, catalyst.

aluminum fluoride, hydrate. $\text{AlF}_3 \cdot 3.5\text{H}_2\text{O}$.

Properties: White, crystalline powder. Slightly soluble in water.

Derivation: Action of hydrofluoric acid on alumina trihydrate and subsequent recovery by crystallization.

Grade: Technical, CP.

Hazard: See fluorine.

Use: Ceramics (production of white enamel).

aluminum fluorosilicate. See aluminum hexafluorosilicate.

aluminum fluosilicate. (aluminum silicofluoride). $\text{Al}_2(\text{SiF}_6)_3$.

Properties: White powder. Slightly soluble in cold water, readily soluble in hot water.

Grade: Technical.

Hazard: See fluorine.

Use: Artificial gems, enamels, glass.

aluminum formate. See aluminum triformate; aluminum diformate.

aluminum formate, basic. See aluminum diformate.

aluminum formate, normal. See aluminum triformate.

aluminum formoacetate. $\text{Al}(\text{OH})(\text{OOCCH}_3)$.

Properties: White powder. Soluble in water and alcohol.

Use: Textile water repellents.

aluminum hexafluorosilicate.

CAS: 17099-70-6. $\text{F}_{18}\text{Si}_3 \cdot 2\text{Al}$.

Hazard: Low toxicity by ingestion.

Source: Natural product.

aluminum hydrate. See alumina trihydrate.

aluminum hydride. AlH_3 .

Properties: White to gray powder. Decomposes at 160C (100C if catalyzed). Evolves hydrogen on contact with water.

Hazard: Dangerous fire and explosion risk.

Use: Electroless coatings on plastics, textiles, fibers, other metals; polymerization catalyst; reducing agent.

aluminum hydroxide. See alumina trihydrate.

aluminum hydroxide gel. (hydrous aluminum oxide; alumina gel). $\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}$.

Properties: White, gelatinous precipitate. Constants variable with the composition, d approx 2.4. Insoluble in water and alcohol, soluble in acid and alkali. Noncombustible.

Derivation: By treating a solution of aluminum sulfate or chloride with caustic soda, sodium carbonate, or ammonia, by precipitation from sodium aluminate solution, by seeding or by acidifying (carbon dioxide is commonly used).

Grade: Technical, CP, USP (containing 4% Al_2O_3), NF (dried containing 50% Al_2O_3).

Use: Dyeing mordant, water purification, waterproofing fabrics, manufacture of lakes, filtering medium, chemicals (aluminum salts), lubricating compositions, manufacture of glass, sizing paper, ceramic glaze, antacid.

aluminum hydroxystearate. $\text{Al}(\text{OH})[\text{OOC}(\text{CH}_2)_{10}\text{CH}_2\text{O}(\text{CH}_2)_5\text{CH}_3]_2$.

Properties: White powder. Mp 155C, d 1.045. Less soluble in nonpolar compounds than other aluminum stearates, and more soluble in polar compounds.

Use: Waterproofing of leather and cements; lubricant for plastics and ropes; paints and inks.

aluminum hypophosphite. $\text{AlH}_6\text{O}_6\text{P}_3$.

Properties: Crystalline solid. Decomposes at 218C. Insoluble in water; soluble in hydrochloric acid, weak sulfuric acid, and sodium hydroxide solution.

Derivation: By heating an aluminum salt solution with sodium hypophosphite.

Hazard: Decomposes to toxic phosphine.

Use: Finishing agent for polyacrylonitrile fiber.

aluminum iodide. AlI_3 (anhydrous).

Properties: Brown-black, crystalline pieces (white when pure). Mp 191C, bp 385C, d 3.9825. Soluble in alcohol, ether, carbon disulfide.

Derivation: Heating aluminum and iodine in a sealed tube.

Method of purification: Crystallization.

Grade: Technical.

Hazard: Reacts violently with water.

Use: Catalyst in organic synthesis.

aluminum isopropoxide. See aluminum isopropylate.

aluminum isopropylate. (aluminum isopropoxide). $\text{Al}(\text{OC}_3\text{H}_7)_3$.

Properties: White solid. D 1.035 (20C), mp 128–132C, bp 138–148C (10 mm). Soluble in alcohol and benzene; decomposes in water.

Derivation: From isopropanol and aluminum.

Grade: Distilled (purity approximately 100%).

Use: Dehydrating agent, catalyst, waterproofing textiles, organic synthesis, paints.

aluminum lactate. $\text{C}_9\text{H}_{15}\text{AlO}_9$.

Properties: Colorless, water-soluble powder.

Use: Fire foam.

aluminum metaphosphate. $\text{Al}(\text{PO}_3)_3$.

Properties: White powder. Mp approximately 1527C. Insoluble in water.

Use: As a constituent of glazes, enamels, and glasses, and as a high-temperature insulating cement.

aluminum monobasic stearate. See aluminum monostearate.

aluminum monopalmitate. See aluminum palmitate.

aluminum monostearate. (aluminum dextran; aluminum monobasic stearate). $\text{Al}(\text{OH})_2[\text{OOC}(\text{CH}_2)_{16}\text{CH}_3]$. A complex containing aluminum and dextran, a chain of molecular weight 2500, corresponding to a chain of 15 anhydroglucose units.

Properties: Fine, white to yellowish-white powder; faint characteristic odor. Mw 344.48, mp 155C, d 1.020. Insoluble in water, alcohol, and ether. Forms a gel with aliphatic and aromatic hydrocarbons.

Derivation: Mixing solutions of a soluble aluminum salt and sodium stearate.

Grade: USP, which describes it as a mixture of the monostearate and monopalmitate containing 14.5–16.0% Al_2O_3 .

Use: Paints, inks, greases, waxes, thickening lubricating oils; waterproofing, gloss producer, stabilizer for plastics, food additive.

aluminum naphthenate.

Properties: Yellow substance of rubbery consistency with high thickening power. Combustible.

Derivation: Reaction of an aluminum salt with an alkali naphthenate in aqueous solution.

Use: Paint and varnish drier and bodying agent, detergent in lube oils, the solution in organic solvents has been proposed for insecticides and siccatives.

See soap (2).

aluminum nicotinate.

CAS: 1976-28-9. $\text{C}_{18}\text{H}_{12}\text{AlN}_3\text{O}_6$.

Properties: Solid.

Use: Food additive.

aluminum nitrate. $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$.

Properties: White crystals. Mp 73C, decomposes at 150C. Soluble in cold water, alcohol and acetone; decomposes in hot water.

Derivation: Formed by the action of nitric acid on aluminum and crystallization.

Grade: Technical, CP (99.75%).

Hazard: Powerful oxidizing agent. Do not store near combustible materials.

Use: Textiles (mordant), leather tanning, manufacture of incandescent filaments, catalyst in petroleum refining, nucleonics, anticorrosion agent, antiperspirant.

aluminum nitride. AlN .

Properties: Crystalline solid. D 3.10, mp 2150C (4.3 atm), Mohs hardness 9+, decomposes when wet into aluminum hydroxide and ammonia.

Derivation: From coal and bauxite when heated in a stream of nitrogen.

Use: As semiconductor in electronics; nitriding of steel.

aluminum oleate. $\text{Al}(\text{C}_{18}\text{H}_{33}\text{O}_2)_3$.

Properties: Yellowish-white, viscous mass. Insoluble in water; soluble in alcohol, benzene, ether, oil, and turpentine. Combustible.

Derivation: By heating aluminum hydroxide, water, and oleic acid. The resultant mixture is filtered and dried.

Use: Waterproofing, drier for paints, etc.; thickener for lubricating oils; medicine; as lacquer for metals; lubricant for plastics; food additive.

aluminum orthophosphate. See aluminum phosphate.

aluminum oxalate. $\text{Al}_2\text{C}_6\text{O}_{12}$.

Properties: Finely divided solid (as hydrate), soluble in nitric and sulfuric acids, almost insoluble in water and alcohol.

Use: Mordant and dyeing assistant.

aluminum oxide. (alumina).

CAS: 1344-28-1. Al_2O_3 . The mineral corundum is natural aluminum oxide, and emery, ruby, and sapphire are impure crystalline varieties. The mixed mineral bauxite is a hydrated aluminum oxide.

Properties: Vary according to the method of preparation. White powder, balls, or lumps of various mesh. D 3.4–4.0, mp 2030C, insoluble in water, difficultly soluble in mineral acids and strong alkali. Noncombustible.

Derivation: (1) Leaching of bauxite with caustic soda followed by precipitation of a hydrated aluminum oxide by hydrolysis and seeding of the solution. The alumina hydrate is then washed, filtered, and calcined to remove water and obtain the anhydrous oxide. (2) Aluminum sulfate from coal mine wastewaters is reduced to alumina.

Grade: Technical, CP, fibers, high purity, fused, calcined.

Hazard: Toxic by inhalation of dust. Confirmed carcinogen.

Use: Production of aluminum, manufacture of abrasives, refractories, ceramics, electrical insulators, catalyst and catalyst supports, paper, spark plugs, crucibles and laboratory wares, adsorbent for gases and water vapors (see alumina, activated), chromatographic analysis, fluxes, lightbulbs, artificial gems, heat-resistant fibers, food additive (dispersing agent).

See alumina trihydrate; aluminum hydroxide gel; alumina, activated.

aluminum oxide, hydrated. See alumina trihydrate.

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aluminum oxide, hydrous. See aluminum hydroxide gel.

aluminum palmitate. (aluminum monopalmitate). $\text{Al}(\text{OH})_2(\text{C}_{16}\text{H}_{31}\text{O}_2)$.

Properties: White powder. Mp 200C, d 1.072. Insoluble in alcohol and water; forms gel with hydrocarbons. Combustible.

Derivation: By heating aluminum hydroxide and palmitic acid and water. The resultant mixture is filtered and dried.

Use: Waterproofing leather, paper, textiles; thickening for lubricating oils; thickening or suspending agent in paints and inks; production of high gloss on leather and paper; ingredient of varnishes; lubricant for plastics; food additive.

aluminum paste. Aluminum powder ground in oil.

Use: Aluminum paints.

aluminum phosphate. (aluminum orthophosphate). AlPO_4 .

Properties: White crystals. D 2.566, mp 1500C. Insoluble in water and alcohol, slightly soluble in hydrochloric acid and nitric acid.

Derivation: Interaction of solutions of aluminum sulfate and sodium phosphate.

Hazard: Solutions are corrosive to tissue.

Use: Ceramics, dental cements, cosmetics, paints and varnishes, pharmaceuticals, pulp and paper.

aluminum phosphide. AIP.

Properties: Dark gray or dark yellow crystals. D 2.85.

Hazard: Dangerous fire risk. It evolves phosphine.

Use: Insecticide, fumigant, semiconductor technology.

aluminum picrate. $\text{Al}[(\text{NO}_2)_3\text{C}_6\text{H}_2\text{O}]_3$.

Hazard: Toxic by ingestion and inhalation, dangerous fire risk in contact with combustibles, severe explosion risk when shocked or heated; strong oxidizer.

Use: Explosive compositions.

aluminum potassium sulfate. (potash alum; alum NF; potassium alum).

CAS: 7784-24-9. $\text{Al}_2(\text{SO}_4)_3 \cdot \text{K}_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$, sometimes written $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Properties: White; odorless crystals; astringent taste. D 1.75, mp 92C, bp loses 18 H_2O at 64.5C, anhydrous at 200C. Soluble in water; insoluble in alcohol. Solutions in water are acid. Noncombustible.

Derivation: (1) From alunite, leucite, or similar mineral. (2) Also derived by crystallization from a solution made by dissolving aluminum sulfate and potassium sulfate and mixing.

Grade: Technical, lump, ground, powdered, NF, FCC.

Use: Dyeing (mordant), paper, matches, paints, tanning agents, waterproofing agents, purification of water, aluminum salts, food additive, baking powder, astringent, cement hardener.

aluminum resinate.

Properties: Brown solid. Insoluble in water; soluble in oils.

Derivation: Heating together soluble aluminum salts and rosin.

Grade: Technical (fused, precipitated).

Use: Drier for varnishes.

Hazard: Flammable, dangerous fire risk.

aluminum rubidium sulfate. (rubidium alum). $\text{AlRb}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Properties: Colorless crystals. Soluble in hot water, insoluble in alcohol. D 1.867, mp 99C.

aluminum salicylate. $\text{Al}(\text{C}_6\text{H}_4\text{OHCOO})_3$.

Properties: Reddish-white powder. Odorless. Soluble in dilute alkalis; insoluble in water, and alcohol. Decomposed by acid.

Use: Medicine.

aluminum silicate. Any of the numerous types of clay which contain varying proportions of Al_2O_3 and SiO_2 . Made synthetically by heating aluminum fluoride at 1000–2000C with silica and water vapor; the crystals or whiskers obtained are up to 1 cm long, have high strength, and are used in reinforced plastics.

Use: Same as for clay.

See mullite; kaolin; satintone.

aluminum silicofluoride. See aluminum fluosilicate.

aluminum silicon. A light-weight alloy available as ingots or in powder form and used for automotive parts, construction, etc. For new manufacturing method, see aluminum derivation.

Hazard: Powder is flammable, dangerous fire risk.

aluminum soaps. See aluminum oleate; aluminum palmitate; aluminum resinate; aluminum stearate; soap (2).

aluminum sodium chloride. See sodium tetrachloroaluminate.

aluminum sodium sulfate. (SAS; sodium aluminum sulfate; soda alum; alum). $\text{Al}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$ or $\text{AlNa}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.

Properties: Colorless crystals; saline, astringent taste; effloresces in air. D 1.675, mp 61C. Soluble in water, insoluble in alcohol. Noncombustible.

Derivation: By heating a solution of aluminum sulfate and adding sodium chloride. The solution is allowed to cool with constant stirring. The alum meal deposited is washed with water and centrifuged.

Method of purification: Recrystallization.

Grade: Pure crystals, technical, CP, FCC.

Use: Textiles (mordant, waterproofing), dry colors, ceramics, tanning, paper size precipitant, matches, inks, engraving, sugar refining, water purification, medicine, confectionery, baking powders, food additive.

aluminum stearate. (aluminum tristearate).

CAS: 637-12-7. $C_{54}H_{105}O_6 \cdot Al$.

Properties: White powder. D 1.070, mp 115C. Insoluble in water, alcohol, ether; soluble in alkali, petroleum, turpentine oil. Forms gel with aliphatic and aromatic hydrocarbons.

Derivation: Reaction of aluminum salts with stearic acid.

Grade: Technical.

Use: Paint and varnish drier, greases, waterproofing agent, cement additive, lubricants, cutting compounds, flattening agent, cosmetics and pharmaceuticals, defoaming agent in beet sugar and yeast processing.

aluminum subacetate. See aluminum acetate.

aluminum sulfate. (alum; pearl alum; pickle alum; cake alum; filter alum; papermakers' alum; patent alum).

$Al_2(SO_4)_3$; (2) $Al_2(SO_4)_3 \cdot 18H_2O$.

Properties: White crystals; sweet taste. Noncombustible. Stable in air, d (1) 2.71, (2) 1.62, mp decomposes at 770C. Soluble in water; insoluble in alcohol.

Derivation: (1) By treating pure kaolin or aluminum hydroxide or bauxite with sulfuric acid. The insoluble silicic acid is removed by filtration, and the sulfate is obtained by crystallization. (2) Similarly, from waste coal-mining shale and sulfuric acid.

Grade: Iron-free, technical, CP, USP, FCC. A liquid form (49.7 H₂O) is also available.

Use: Sizing paper, lakes, alums, dyeing mordant foaming agent in fire foams, cloth fireproofing, white leather tannage, catalyst in manufacturing ethane, pH control in paper industry, waterproofing agent for concrete, clarifier for fats and oils, lubricating compositions, deodorizer and decolorizer in petroleum refining, sewage precipitating agent and for water purification, food additive.

aluminum sulfide. Al_2S_3 .

Properties: Yellowish-gray lumps. Odor of hydrogen sulfide. Decomposes in moist air to hydrogen sulfide and a gray powder. D 2.02, mp 1100C.

Hazard: Irritant to skin and mucous membranes.

Use: To prepare hydrogen sulfide.

aluminum tartrate. $C_{12}H_{12}Al_2O_{18}$.

Properties: Crystalline powder. Soluble in hot water and ammonia.

Use: Textile dyeing auxiliary.

aluminum thiocyanate. (aluminum sulfocyanate). $Al(SCN)_3$.

Properties: Yellowish powder. Soluble in water; insoluble in alcohol and ether.

Use: Mordant for textile dyeing, manufacturing pottery.

aluminum trialkyl. See triethylaluminum; triisobutylaluminum.

aluminum tributyl. See *n*-tributyl aluminum.

aluminum triethyl. See triethyl aluminum.

aluminum triformate. (aluminum formate, normal). $Al(HCOO)_3 \cdot 3H_2O$.

Properties: White, crystalline powder. Soluble in hot water; slightly soluble in cold water.

Use: Textile (delustering rayon, mordanting, waterproofing, after-treatment of dyeings), paper (sizing), fur dyeing (mordant), and medicine.

aluminum trimethyl. See trimethyl aluminum.

aluminum triricinoleate. $Al(C_{17}H_{32}OHCOO)_3$.

Properties: Yellowish to brown plastic mass. Mp 95C. Limited solubility in most organic solvents. Combustible.

Derivation: Castor oil.

Use: Gelling agent, waterproofing, solvent-resistant lubricants.

aluminum tristearate. See aluminum stearate.

alumite. (alumstone). A hydrous sulfate of potassium and aluminum that occurs commonly as fine-grained masses.

alum, NF. May be either aluminum ammonium sulfate or aluminum potassium sulfate.

alum, papermakers. See aluminum sulfate.

alum, pearl. Specially prepared aluminum sulfate for the papermaking industry.

alum, pickle. Aluminum sulfate prepared to meet specifications of packers and preservers.

alum, porous. See aluminum sodium sulfate.

alum, potash. See aluminum potassium sulfate.

alum, soda. See aluminum sodium sulfate.

alunite. (alum stone).

CAS: 1344-28-1. $KAl_3(OH)_6(SO_4)_3$. A naturally occurring basic potassium aluminum sulfate usually found with volcanic and other igneous rocks.

Occurrence: Utah, Arizona, California, Colorado, Nevada, Washington, Italy, Australia.

ALUOROCHROME

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Use: Production of aluminum potassium compounds, millstones, substitute for bauxite in aluminum manufacture, decolorizing and deodorizing agent, fertilizer.

aluorochrome. A natural or synthetic dye.

Properties: Fluoresce.

Am. Symbol for americium.

AMA-10.

CAS: 6317-18-6. Methylene bithiocyanate.

Grade: 99% dry powder, 10% solution.

Available forms: Powder, liquid.

Use: Pesticide, raw materials for use in paper mills, cooling towers, petroleum drilling, water treatment, leather processing.

Amadori rearrangement. Conversion of *N*-glycosides of aldoses to *N*-glycosides of the corresponding ketoses by acid or base catalysis.

amagat unit. A compressibility factor, equal to pressure in atmospheres times volume under standard conditions.

amalgam. A mixture or alloy of mercury with any of a number of metals or alloys, including cesium, sodium, tin, zinc, lithium, potassium, gold, and silver as well as with some nonmetals. Dental amalgams are mixtures of mercury with a silver tin alloy. A sodium amalgam is formed in the preparation of pure sodium hydroxide by electrolysis of brine.

Use: Dental fillings, silvering mirrors, catalysis, analytical separation of metals; to facilitate application of active metals such as sodium, aluminum, and zinc in the preparation of titanium, etc., or in reduction of organic compounds.

See sodium amalgam.

amanitin. (α) $C_{39}H_{54}N_{10}O_{13}S$. (β) $C_{39}H_{53}N_9O_{14}S$. Toxic principle from a species of mushroom (*Amanita phalloides*). The β form has been obtained as acicular crystals which are soluble in water, methanol, and ethanol.

Hazard: A poison. Ingestion may be fatal.

amantadine hydrochloride. (1-adamantanamine hydrochloride). $C_{10}H_{17}\cdot HCl$. A derivative of adamantane. An anti-viral drug. Also used in treatment of Parkinson's disease.
See "Symmetrel" [*Endo*].

amaranth. (FDC Red No. 2; Red Dye No. 2). CAS: 915-67-3. $NaSO_3C_{10}H_5N=NC_{10}H_4(SO_3Na)_2OH$. An azo dye derived from naphthionic and R acids.

Properties: Dark red to purple powder. D approximately 1.50. Soluble in water, glycerol, propylene glycol; insoluble in most organic solvents.

Hazard: A questionable carcinogen. May not be used in foods, drugs, or cosmetics.

Use: Formerly a certified food and drug colorant. (Replaced for some applications by FDC Red No. 40.) Textile dye, color photography.

amatol. An explosive mixture of ammonium nitrate and TNT. The 50:50 mixture can be melted and poured for filling small shells; the 80% ammonium nitrate mixture is granular.

Hazard: Highly explosive. A powerful irritant to mucous membranes and by skin absorption.

amber. A polymerized fossil resin derived from an extinct variety of pine. Readily accumulates static electrical charge by friction; good electrical insulator.

ambergris. A waxy, opaque mass containing 80% cholesterol formed in the intestinal tract of the sperm whale and found on beaches or afloat in the ocean.

Use: A fixative in perfumes, now largely replaced by synthetic products.

"Amberlac" [Reichhold]. TM for modified alkyd-type resins for quick-drying lacquers.

Use: Metal primers, bottle cap coatings, food can coatings, appliance coatings.

"Amberlite" [Dow]. TM for several types of ion-exchange resins. Insoluble cross-linked polymers of various types in minute bead form. Strong acid, weak acid, strong base, and weak base forms, each having various grades differing in exchange capacity and porosity, for removing simple and complex cations and anions from aqueous and non-aqueous solutions. Reversible in action; can be regenerated.

Grade: Laboratory, liquid, nuclear, mixed bed, pharmaceutical.

Use: Water conditioning (softening and complete deionization), recovery and concentration of metals, antibiotics, vitamins, organic bases, catalysis, decolorization of sugar, manufacture of chemicals, neutralization of acid mine-water drainage, analytical chemistry, water treatment in nuclear reactors, pharmaceuticals.

Amberol. Maleic-resin and resin-modified and unmodified phenolformaldehyde-type polymers in solid form. They react with various oils to produce fast-drying, high-gloss protective coatings and vehicles for printing inks.

Use: Varnishes, enamels, can liners, nitrocellulose sanding sealers, printing inks, tackifying and vulcanization of butyl rubber.

"Ambien" [Sanofi]. TM for zolpidem tartrate.

Use: Drug.

ambient air. The air that immediately surrounds an individual, a population, a community, or any real entity of interest and which potentially affects that entity.

ambient temperature. The temperature of the environment in which an experiment is conducted or in which any physical or chemical event occurs. See room temperature.

ambithion. See fenitrothion-malathion mixture.

“Ambitrol” [Dow]. TM for coolants used in stationary industrial engines.

amblygonite. $\text{Li}(\text{AlF})\text{PO}_4$ or $\text{AlPO}_4 \cdot \text{LiF}$. A natural fluorophosphate of aluminum and lithium.

Properties: White to grayish-white. Contains up to 10.1% lithia, sometimes with partial replacement by sodium. D 3.01–3.09, Mohs hardness 6.

Occurrence: California, Maine, Connecticut, South Dakota, Germany, Norway, France.

Use: A source of lithium used in glazes and coatings.

ambomycin (USAN). An antibiotic produced by *Streptomyces ambofaciens*.

ambrette seed oil.

Properties: Volatile oil from seeds of *Abelmoschus moschatus* Moench, syn. *Hibiscus Abelmoschus L.* (Fam. *Malvaceae*). Amber liquid; odor of ambrettolide. Sol in fixed oils; insol in glycerin, propylene glycol.

Use: Food additive.

ambrettolide. (ω ,6-hexadecenolactone; 6-hexadecenolide; 16-hydroxy-6-hexadecenoic acid; ω -lactone). $\text{C}_{16}\text{H}_{28}\text{O}_2$.

Properties: Colorless liquid having powerful musk-like odor. Found in ambrette seed oil.

Use: Flavoring, perfume fixative.

amebicide. (amebacide; emetine; (2S,3R,11bS)-2{[[(1R)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinolin-1-yl]methyl]-3-ethyl-9,10-dimethoxy-2,3,4,6,7,11b-hexahydro-1H-pyrido[2,1-a]isoquinoline dihydrochloride). $\text{C}_{29}\text{H}_{41}\text{ClN}_2\text{O}_4$. The principle alkaloid of ipecac. It inhibits protein synthesis in eukaryotic cells but not prokaryotic cells.

Derivatives: From the ground roots of *Uragoga* (or *Cephaelis*) *ipecacuanha* or *Uragoga acuminata* of the *Rubiaceae*.

Hazard: May cause cardiac, hepatic or renal damage, violent diarrhea and vomiting.

Use: Amebicide.

“Amerchol” [Union]. TM for a series of surface-active lanolin derivatives; most are soft solids.

Use: Emulsifiers and stabilizers for water and oil systems, emollients in pharmaceuticals and cosmetics.

American Association for the Advancement of Science. (AAAS). Founded in 1848. The

largest general scientific organization representing all fields of science. Membership includes 120,000 individuals and 262 societies. The interests of this association extend into all areas of natural and social science. Its leading publication is *Science*, established by Thomas Edison in 1880. It also publishes many symposium volumes based on papers presented at its annual meetings. One of its important activities in chemistry is sponsorship of the Gordon Research Conferences, which originated in 1931 under the leadership of Dr. Neil E. Gordon; these have since been expanded to more than 30 technical conferences attended by chemists from many foreign countries. Society headquarters are located at 1200 New York Ave NW, Washington, D.C. 20005. Website: <http://www.aaas.org>

American Association of Textile Chemists and Colorists. (AATCC). Founded in 1921. It has

over thousands of individual and corporate members in more than 60 countries world wide. A technical and scientific society of textile chemists and colorists in textile and related industries using colorants and chemical finishes. It is the authority for test methods. It is located at 1 Davis Drive, Research Triangle Park, NC 27709. Website: <http://aatcc.org>

American Carbon Society. (ACS). The American

Carbon Society (ACS), formally the American Carbon Committee, was established in 1957 with the express purpose of organizing U.S. conferences on carbon. The Society promotes interdisciplinary research and technology in the field of carbon science. Moreover, the Society sponsors a Biennial Conference on Carbon. The ACS promotes carbon science and technology through its Graffin Lecture series. It publishes *CARBON*, an international journal. Its mailing address is University of Kentucky, Center for Applied Energy Research, 2540 Research Park Drive, Lexington, KY 40511. Website: <http://www.americancarbonsociety.org>

American Ceramic Society. (ACerS).

Founded 1898. It has 9500 members. A professional society of scientists, engineers, researchers, manufacturers, plant personnel, educators, students, marketing and sales professionals interested in glass, ceramics-metal systems, cements, refractories, nuclear ceramics, white wares, electronics, and structural clay products. It is located at 600 N. Cleveland Ave., Suite 210, Westerville, OH 43082. Website: <http://www.ceramics.org>

American Chemical Society. (ACS). Founded

in 1876. It has over 161,000 members. The nationally chartered professional society for chemists in the U.S. One of the largest scientific organizations in the world. Its offices are at 1155 16th St., NW,

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Washington D.C. 20036. For further information, see Appendix IIB.

Website: <http://www.acs.org>

See Chemical Abstracts.

American Chemistry Council. (ACC).

Founded in 1863, and formerly called the Chemical Manufacturers Association, this nonprofit trade association of chemical manufacturers represents the voice of the US Chemical Industry. The American Chemistry Council represents the chemical industry on public policy issues, coordinates the industry's research and testing programs, and administers the industry's environmental, health, and safety performance improvement initiative, known as Responsible Care. The American Chemistry Council is located at 1300 Wilson Boulevard in Arlington, VA.

It has instituted an emergency telephone information service called ChemTrec to provide instant information for safety precautions in accidents involving chemicals.

Website: <http://www.cmahq.com>

American Conference of Governmental Industrial Hygienists. (ACGIH).

Founded in 1938. Over 3000 members. A society of persons employed by official government units responsible for programs of industrial hygiene, education, and research. It was founded for the purpose of determining standards of exposure to toxic and otherwise harmful materials in workroom air. The standards are revised annually and are available from the secretary. It is located at 1330 Kemper Meadow Drive, Cincinnati, OH 45240. Website: <http://www.acgih.org>

See Threshold Limit Value.

American Institute of Chemical Engineers. (AIChE).

Founded in 1908. There are approximately 45,000 members. The largest society in the world devoted exclusively to the advancement and development of chemical engineering. Its official publication is *Chemical Engineering Progress*. It has 110 local sections and many committees working in a wide range of activities. Its offices are located at 120 Wall Street, FL 23, New York, NY 10005. Website: <http://www.aiche.org>

American Institute of Chemists. (AIC).

Founded in 1923, it is primarily concerned with chemists and chemical engineers as professional people rather than with chemistry as a science. Special emphasis is placed on the scientific integrity of the individual and on a code of ethics adhered to by all its members. It publishes a monthly journal, *The Chemist*. It is located at 315 Chestnut Street, Philadelphia, PA 19106. Website: <http://www.theaic.org>

American Leather Chemists' Association. (ALCA).

Founded in 1903. This group works

to devise and perfect methods for the analysis and testing of leathers and materials used in leather manufacturing. It is located at 1314 50th Street, Suite 103, Lubbock, TX 79412. Website: <http://www.leatherchemists.org>

American National Standards Institute. (ANSI).

Founded in 1918. A federation of trade associations, technical societies, professional groups, and consumer organizations that constitutes the U.S. clearinghouse and coordinating body for voluntary standards activity on the national level. It eliminates duplication of standards activities and combines conflicting standards into single, nationally accepted standards. It is the U.S. member of the International Organization for Standardization and the International Electrochemical Commission. Over 125,000 companies are members of the ANSI. One of its primary concerns is safety in such fields as hazardous chemicals, protective clothing, welding, fire control, electricity and construction operations, blasting, etc. Its address is 1899 L Street, NW, 11th Floor, Washington, D.C. 20036. Website: <http://www.ansi.org>

American Oil Chemist's Society. (AOCS).

Founded in 1909. It has over 4300 members. These members are chemists, biochemists, chemical engineers, research directors, plant personnel, and persons concerned with animal, marine, and regular oils and fats and their extraction, refining, safety, packaging, quality control and use. The address is 2710 S. Boulder, Urbana, IL 61802. Website: <http://www.aocs.org>

American Petroleum Institute. (API).

Founded in 1919. It has 500 members. The members are the producers, refiners, marketers, and transporters of petroleum and allied products such as crude oil, lubricating oil, gasoline, and natural gas. The address is 1220 L Street, NW, Washington, D.C. 20005. Website: <http://www.api.org>

American Society for Testing and Materials. (ASTM).

This society, organized in 1898 and chartered in 1902, is a scientific and technical organization formed for "the development of standards on characteristics and performance of materials, products, systems and services, and the promotion of related knowledge." There are over 30,000 members. It is the world's largest source of voluntary consensus standards. The society operates via more than 143 main technical committees that function in prescribed fields under regulations that ensure balanced representation among producers, users, and general-interest participants. Headquarters of the society is at 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428. Website: <http://www.astm.org>

American Society of Pharmacology and Experimental Therapeutics. (ASPET).

Founded in 1908. It has over 4800 members. It is a scientific society of investigators in pharmacology and toxicology interested in research and promotion of pharmacological knowledge and its use among scientists and the public. The address is 9650 Rockville Pike, Bethesda, MA 20814. Website: <http://www.aspet.org>

americium. Am. A synthetic radioactive element of atomic number 95, a member of the actinide series; aw 241; 14 isotopes of widely varying half-life; valence 3, but divalent, tetravalent, and higher valencies exist. α and γ emitter, forms compounds with oxygen, halides, lithium, etc. Metallic americium is silver-white crystalline, d 13.6, mp approximately 100C. Half-life of ^{241}Am is 458 years.

Derivation: Multiple neutron capture in plutonium in nuclear reactors, plutonium isotopes yield ^{241}Am and ^{243}Am on β decay. The metal is obtained by reduction of the trifluoride with barium in vacuum at 1200C.

Hazard: A radioactive poison.

Use: Gamma radiography, radiochemical research, diagnostic aid, electronic devices.

“Amerlate” phosphorus [Amerchol]. TM for the isopropyl ester of hydroxy, normal, and branched-chain acids of lanolin. A light-yellow, soft solid that liquefies on contact with the skin. A hydrophilic emollient, moisturizer, conditioning agent, lubricant, pigment dispersant, and nonionic auxiliary without emulsifier.

Ames dial. A device used for measuring the thickness of paint film.

Ames test. A simple bacterial test for carcinogens, based on the assumption that carcinogens are mutagens. Named after its inventor Bruce Ames. Somewhat less favored than it used to be, because of the idea that compounds causing cells to grow more rapidly will sometimes result in cancer.

amethopterin. See methotrexate.

ametryn. (2-thiamino-4-isopropylamino-6-methylmercapto-*s*-triazine; *N*/ethyl-*n'*-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine; ametryne; 4-*N*-ethyl-6-methylsulfanyl-2-*N*-propan-2-yl-1,3,5-triazine-2,4-diamine).

CAS: 834-12-8. $\text{C}_9\text{H}_{17}\text{N}_5\text{S}$. A methylthiothiazine similar in biological properties to atrazine and simazine but absorbed through foliage as well as the roots of green plants.

Use: Pre-emergence and post-emergence herbicides.

ametryn-atrazine mixture. See herbifert.

amiben. Generic name for 3-amino-2,5-dichlorobenzoic acid. $\text{C}_6\text{H}_2\text{NH}_2\text{Cl}_2\text{COOH}$.

Use: Herbicide or plant growth regulator.

amic acid. (carbamoyl carboxylic acid). Any of a class of organic compounds that contain a carboxy and a carboxamide group.

amicyanin. An electron transfer protein found in certain bacteria that contains a type 1 copper site.

amidase. (acylase; acylamidase; amidohydrolyase).

CAS: 9012-56-0. Any deamidizing hydrolase that catalyses the hydrolysis of mono carboxylic amides, yielding the free acid and ammonia.

amide. A nitrogenous compound related to or derived from ammonia. Reaction of an alkali metal with ammonia yields inorganic amides, e.g., sodium amide (NaNH_2). Organic amides are characterized by an acyl group ($-\text{CONH}_2$) usually attached to an organic group ($\text{R}=\text{CONH}_2$); formamide (HCONH_2) and carbamide (urea) $\text{CO}(\text{NH}_2)_2$ are common examples.

See polyamide.

amide herbicide. Any of a family of herbicides that inhibit seed germination and/or growth of seedlings, probably by blocking protein synthesis in the primary meristems. When applied to foliage, localized or general necrosis is seen at the loci of contact.

Use: Herbicide.

amide oxime. Any of a class of organic compounds and derivatives formed by substitution of carboxamides.

amidinase. A deamidinating enzyme that enables the hydrolysis of a nonpeptide C-N bond of an amidine.

amidine. Any strong monobasic organic compound resulting from the reaction of ammonia with nitriles or with imido esters.

amidinomycin. $\text{C}_9\text{H}_{18}\text{N}_4\text{O}$. An antibiotic that partially inhibits spore-forming bacteria.

4-amidino-1-(nitrosaminoamidino)-1-tetrazene. See tetrazene.

amido black. (disodium(6Z)-4-amino-3-(4-nitrophenyl)diazenyl-5-oxo-6-(phenylhydrazinylidene)naphtha-2,7-disulfonate).

$\text{C}_{22}\text{H}_{14}\text{N}_6\text{Na}_2\text{O}_9\text{S}_2$. A blue-black protein stain.

Use: In forensics to make bloody friction ridges more detailed.

amido black 10b. (sodium-4-amino-3-(4-nitrophenyl)diazenyl-5-oxo-6-(phenylhydrazinylidene)naphtha-2,7-disulfonic acid). $\text{C}_{22}\text{H}_{16}\text{N}_6\text{O}_9\text{S}_2$. An acid diazo dye.

Use: Protein stain in paper chromatography and electrophoresis; connective tissue stain.

AMIDOHYDROLASE

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amidohydrolase. (amidase; deamidase; deamidizing enzyme). Any of a class of enzymes that catalyze the hydrolysis of C-N bonds in amides.

amidol. See 2,4-diaminophenol hydrochloride.

amidopropylamine oxide.

Use: Foamer, foam booster, foam stabilizer; scour for household, cosmetic, and industrial applications.

amidoxime. (amide oxime; N-[amino-4[-5-[4-[amino(nitroso)methylidene]cyclo-2,5-dien-1-ylidene]furan-2-ylidene]cyclohexa-2,5-dien-1-ylidene]methyl]hydroxylamine). $C_{18}H_{16}N_4O_3$. Any oxime of an amide.

amidoxyl. The radical of an amidoxime in which the terminal H of the NOH group has been removed.

aminacrine hydrochloride. USAN name for 9-amino-acridine hydrochloride.

amination. The process of making an amine (RNH_2). The methods commonly used are (1) reduction of a nitro compound, and (2) action of ammonia on a chloro, hydroxy, or sulfonic acid compound.

amine. A class of organic compounds of nitrogen that may be considered as derived from ammonia (NH_3) by replacing one or more of the hydrogen atoms with alkyl groups. The amine is primary, secondary, or tertiary depending on whether one, two, or three of the hydrogen atoms are replaced. All amines are basic in nature and usually combine readily with hydrochloric or other strong acids to form salts.
See fatty amine.

amine 220. 2-(8-heptadecenyl)-2-imidazoline-1-ethanol).



Properties: D 0.9330 (20/20C), bulk d 7.76 (20C) lb/gal, bp 235C (1 mm), flash p 465F (240C). Combustible.

Use: Demulsifier used particularly in the recovery of tar from water-gas process emulsions. A powerful cationic wetting agent. Useful in flotation processes involving siliceous minerals and the formation of emulsions and dispersions under acidic conditions.

amine 248. Dark-colored liquid or paste consisting of a nonvolatile amine mixture with *bis*-(hexamethylene)triamine and its homologs as principal components. Disperses readily in water.

Use: Coagulant and flocculating agent, ingredient of antistripping agents for asphalt, corrosion inhibitor, anchoring agent, for making cationic amine salts.

amine absorption process. See Girbotol absorption.

aminimide. Any of a group of nitrogen compounds derived by reaction of 1,1-dimethylhydrazine with an epoxide in the presence of an ester of a carboxylic acid. A number of types of epoxides and esters may be used, providing a wide variety of products, including short- and long-chain aliphatics and aromatics. Their major uses are in tire-cord dips to increase adhesion of cord to rubber, in soil-removing detergents (nonionic), in coating formulations, and in cosmetic creams and shampoos. They are stated to be biodegradable and without toxic hazard. They also have elastomer and cross-linking applications from adhesives, caulks, and sealants to foams and mechanical goods. As isocyanate precursors, aminimides can be prepared in a large number of structural variations. Bisaminimides are especially valuable for producing stable, single-package prepolymer compositions for in situ generation of isocyanates in polyurethane applications.

***p*-aminoacetanilide.** (4'-aminoacetanilide; *N*-acetyl-*p*-phenylenediamine). $NH_2C_6H_4NHCOCH_3$.

Properties: Colorless or reddish crystals. Mp 162C, bp 267C. Soluble in alcohol and ether; slightly soluble in water. Combustible.

Derivation: Acetylation of *p*-phenylenediamine.

Hazard: Moderate toxicity by ingestion.

Use: Intermediate for azo dyes and pharmaceuticals.

aminoacetic acid. See glycine.

aminoacetophenetidide hydrochloride. See phenocoll hydrochloride.

amino acid. An organic acid containing both a basic amino group (NH_2) and an acidic carboxyl group ($COOH$). Amino acids are amphoteric and exist in aqueous solution as dipolar ions. The 25 amino acids that have been established as protein constituents are α -amino acids (i.e., the $-NH_2$ group is attached to the carbon atom next to the $-COOH$ group). Many other amino acids occur in the free state in plant or animal tissue. At least 22 amino acids with structures identical with those that exist today have been identified in pre-Cambrian sedimentary rock, indicating an age of at least 3 million years. Amino acids have been created in the laboratory by passing an electrical discharge through a mixture of ammonia, methane, and water vapor; it is believed that a similar reaction may have accounted for the original synthesis of amino acids on earth. Amino acids can be obtained by hydrolysis of a protein; or they can be synthesized in various ways, especially by fermentation of glucose. An essential amino acid is one that cannot be synthesized by the body and is necessary for survival, namely,

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isoleucine phenylalanine, leucine, lysine, methionine, threonine, tryptophan, and valine. Nonessential amino acids (alanine, glycine, and about a dozen others) can be synthesized by the body in adequate quantities. Arginine and histidine are essential during periods of intensive growth. All the essential and most of the nonessential amino acids have one or more asymmetric carbon atoms and are optically active. Amino acids are the building blocks of molecular biology. Various combinations of amino acids form the proteins, which are highly complex molecules present in all living things. *Note:* Use of amino acids as fortification additives to foods is restricted by the FDA to foods containing proteins. See genetic code; deoxyribonucleic acid; chromatin; protein; life, origin.

amino acid activation. Enzymatic esterification of the carboxyl group of an amino acid to the 3'-hydroxyl group of its corresponding tRNA which requires 2 ATP-equivalents of energy.

amino acid alkaloid. Usually an ergot alkaloid such as bromocriptine or ergotamine.

amino acid antagonist. A substance that inhibits the absorption, metabolism, or biological activity of an amino acid.

amino acid antagonistic. (antipathic). Having the action of an antagonist.

amino acid oxidase. See amino oxidase.

amino-acid residue. A structure (in addition to water) that results from the combination of two or more amino acids to form a peptide. Such a residue lacks a hydrogen atom of the amino group or the hydroxy group of the carboxy group or both. Thus each unit of the peptide chain are amino-acid residues.

aminoacyl-tRNA. An aminoacyl ester of a tRNA.

aminoacyl-tRNA synthetases. Enzymes that catalyze synthesis of an aminoacyl tRNA at the expense of ATP energy.

aminoamylene glycol. See 2-amino-2-ethyl-1,3-propanediol.

5-amino-2-anilobenzenesulfonic acid. See 4-amino-diphenylamine-2-sulfonic acid.

***o*-aminoaniline.** See *o*-anisidine.

***p*-aminoaniline.** See *p*-anisidine.

aminoanthraquinone.
CAS: 117-79-3. $C_6H_4(CO)_2C_6H_3NH_2$.
Tricyclic: (1) 1-amino, (2) 2-amino.

Properties: (1) Red, iridescent needles. (2) Red or orange-brown needles. Soluble in alcohol, chloroform, benzene, and acetone; insoluble in water. Mp (1) 252C, (2) 302C, bp sublimes (both 1 and 2).

Derivation: By reduction of nitroanthraquinones, or by the substitution of the amino radical direct for the sulfonic acid.

Hazard: Questionable carcinogen.

Use: Dye and pharmaceutical intermediate.

4-aminoantipyrine. (4-amino-1,5-dimethyl-2-phenyl-3-pyrazolone; 1,5-dimethyl-2-phenyl-4-aminopyrazolone). $C_{11}H_{13}N_3O$.

Properties: Mp 107–109C.

Use: Analytical reagent.

***p*-aminoazobenzene.** (aniline yellow; phenylazoaniline).

CAS: 60-09-3. $C_6H_5NNC_6H_4NH_2$.

Properties: Yellow to tan crystals. Mp 126–128C, bp above 360C. Soluble in alcohol and ether; slightly soluble in water.

Derivation: (1) Heating diazoaminobenzene with aniline hydrochloride as catalyst. (2) Diazotization of a solution of aniline and aniline hydrochloride with hydrochloric acid and sodium nitrite.

Hazard: Possible carcinogen.

Use: Dyes (chrysoidine, induline, solid yellow, and acid yellow), insecticide.

***p*-aminoazobenzene.** ((*p*-phenylazo)aniline; C.I. 11000; C.I. solvent blue 7; 4-phenyldiazenylaniline).

CAS: 60-09-3. $C_{12}H_{11}N_3$.

Properties: Aromatic amine; high lipophilicity.

Hazard: Bioaccumulate; toxic; possible carcinogen.

Use: Dye in lacquers, varnishes, stains and resins; an intermediate in the manufacture of acid yellow and indulines.

4-aminoazobenzene-3,4'-disulfonic acid. (Acid Yellow 9). $C_6H_4(SO_3H)NNC_6H_3NH_2(SO_3H)$.

Properties: Bright, violet needles.

Use: For synthesizing dyes for dyeing wool.

***p*-aminoazobenzene hydrochloride.** (aminoazobenzene salt). $C_6H_5NNC_6H_4NH_2 \cdot HCl$.

Properties: Steel-blue crystals. Soluble in alcohol; slightly soluble in water.

Derivation: By passing dry hydrogen chloride gas into a solution of aminoazobenzene.

Hazard: Suspected carcinogen.

Use: Dyes, coloring lacquers, intermediate.

aminoazobenzemonosulfonic acid. $NH_2C_6H_4NNC_6H_4SO_3H$.

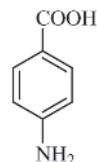
Properties: Yellowish-white, microscopic needles. Barely soluble in water; almost insoluble in alcohol, ether, and chloroform.

***o*-AMINOAZOTOLUENE**

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Derivation: By sulfonating aminoazobenzene.**Hazard:** Suspected carcinogen.**Use:** Dyestuff manufacture.***o*-aminoazotoluene.** (Solvent Yellow; 3,2-amino-5-azotoluene; toluazotoluidine).CAS: 97-56-3. $\text{CH}_3\text{C}_6\text{H}_4\text{N}_2\text{C}_6\text{H}_3\text{NH}_2\text{CH}_3$.**Properties:** Reddish-brown to yellow crystals. Mp 100–117C. Soluble in alcohol, ether, oils, and fats; slightly soluble in water.**Derivation:** From *o*-toluidine by treatment with nitrite and hydrochloric acid.**Hazard:** Possible carcinogen.**Use:** Dyes, medicine.**6*p*-(*p*-aminobenzamido)benzamido-1-naphthol-3-sulfonic acid.** $\text{H}_2\text{NC}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{CONHC}_{10}\text{H}_5(\text{OH})(\text{SO}_3\text{H})$.

Gray paste containing approximately 35% solids.

Use: Intermediate.**aminobenzene.** See aniline.***p*-aminobenzenearsonic acid.** See arsanic acid.**2-amino-*p*-benzenedisulfonic acid.** (aniline-2,5-disulfonic acid). $\text{C}_6\text{H}_3\text{NH}_2(\text{SO}_3\text{H})_2 \cdot 4\text{H}_2\text{O}$.**Properties:** Crystals. Very soluble in water and alcohol.**Derivation:** Boiling sodium salt of 4-chloro-3-nitrobenzene sulfonate with sodium sulfite, resulting in formation of sodium-2-nitrobenzene disulfonate, which is reduced with iron and acetic acid to aniline-2,5-disulfonic acid.**Use:** Intermediate.**4-amino-*m*-benzenedisulfonic acid.** (aniline-2,4-disulfonic acid). $\text{C}_6\text{H}_3\text{NH}_2(\text{SO}_3\text{H})_2 \cdot 2\text{H}_2\text{O}$.**Properties:** Needles decompose when heated above 120C. Very soluble in water and alcohol.**Derivation:** By heating sulfanilic acid with fuming sulfuric acid at 170–180C.**Use:** Dye intermediate.***m*-aminobenzenesulfonic acid.** See metanilic acid.***p*-aminobenzenesulfonic acid.** See sulfanilic acid.***m*-aminobenzoic acid.** $\text{C}_6\text{H}_4\text{NH}_2\text{CO}_2\text{H}$. CAS: 99-05-8.**Properties:** Yellowish or reddish crystals, sublimes easily, sweet taste. Mp 173–174C. Slightly soluble in water, alcohol, and ether.**Use:** Dye intermediate.***o*-aminobenzoic acid.** See anthranilic acid.***p*-aminobenzoic acid.** (PABA).CAS: 150-13-0. $\text{NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$. Required by many organisms as a vitamin for growth, active in neutralizing the antibacteriostatic effect of some sulfonamide drugs.**Properties:** Light buff, odorless crystals; white when pure; discolor on exposure to light and air. Mp 186–187C. Sparingly soluble in cold water; soluble in hot water, glacial acetic acid, ethyl acetate. Unstable to ferric salts and oxidizing agents.**Derivation:** Reduction of *p*-nitrobenzoic acid. Commercially available as the calcium, potassium, and sodium salts.**Food source:** Widely distributed, especially in yeast.**Grade:** Technical, NF.**Hazard:** Questionable carcinogen.**Use:** Dye intermediate, pharmaceuticals, nutrition, UV absorber in suntan lotions.**2-aminobenzothiazole.** $\text{C}_6\text{H}_4\text{NC}(\text{NH}_2)\text{S}$ (bicyclic).**Use:** As an azo dye intermediate and in photographic chemicals.***m*-aminobenzotrifluoride.**CAS: 98-16-8. $\text{CF}_3\text{C}_6\text{H}_4\text{NH}_2$.**Properties:** Colorless to oily yellow liquid.**Grade:** Technical (88% min), purified (98% min).**Use:** Pharmaceutical intermediate.***o*-aminobenzoylformic anhydride.** See isatin.***N*-(*p*-aminobenzoyl)glycine.** See *p*-aminohippuric acid.***o*-aminobiphenyl.** (*o*-phenylaniline; *o*-biphenylamine).CAS: 90-41-5. $\text{C}_6\text{H}_5\text{C}_6\text{H}_4\text{NH}_2$.**Properties:** Colorless or purplish crystals. Mp 49.3C, bp 299C. Slightly soluble in water.**Derivation:** Reduction of *o*-nitrobiphenyl.**Hazard:** Toxic by ingestion, inhalation, and skin absorption. A carcinogen.**Use:** Research, analytical chemistry.**1-aminobutane.** See *n*-butylamine.**2-aminobutane.** See *sec*-butylamine.**aminobutanoic acid.** See aminobutyric acid.**2-amino-1-butanol.**CAS: 96-20-8. $\text{CH}_3\text{CH}_2\text{CHNH}_2\text{CH}_2\text{OH}$.

Properties: Colorless liquid. D 0.944 at 20/20C, mp -2C, bp 178C (at 10 mm Hg = 79-80C), flash p 164F (73.3C), bulk wt 7.85 lb/gal (20C); pH (0.1 M aqueous solution) 11.11, refr index 1.453 (20C). Completely miscible with water at 20C; soluble in alcohols. Corrosive to copper, brass, aluminum. Combustible.

Use: Emulsifying agent (in soap form) for oils, fats, and waxes; absorbent for acidic gases; organic synthesis.

aminobutyric acid. (aminobutanoic acid; GABA).

CAS: 56-12-2. An unusual amino acid having the following isomers: α : $\text{CH}_3\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH}$. Isolated from a bacterium (*Corynebacterium diphtheriae*). The *dl* form is a crystalline solid, mp 305C, soluble in water, slightly soluble in alcohol, insoluble in ether. The *l*(+) form is solid, mp 270C, sweetish taste, soluble in water. β : $\text{CH}_2\text{CH}(\text{NH}_2)\text{CH}_2\text{COOH}$. The *dl* form is a tasteless solid, mp 190C, water soluble, insoluble in ether and alcohol. The *d*(-) form decomposes at 220C. γ : (GABA) $\text{H}_2\text{N}(\text{CH}_2)_3\text{COOH}$. Obtained from bacteria, yeast, and plant life. Crystalline solid, mp 202C, soluble in water, insoluble in organic solvents. Decomposes to pyrrolidone and water on quick heating. This substance is reported to be a neurotransmitter that activates or retards nervous reactions in the cells of the brain, including the sense of pain. All three isomers have been synthesized by various reaction sequences, the first reported in 1880.

$\tilde{\alpha}$ -aminobutyric acid. (4-aminobutanoic acid; $\tilde{\alpha}$ -amino-*n*-butyric acid; piperidic acid; GABA).

CAS: 56-12-2. $\text{C}_4\text{H}_9\text{NO}_2$. An amino acid that is not a component of protein. It is an inhibitory neurotransmitter of the CNS and may mediate the inhibitory actions of local interneurons. Inhibition of the synthesis or transmission of $\tilde{\alpha}$ -aminobutyric acid can cause convulsions.

Derivation: It occurs chiefly in nervous tissue.

Use: Hypertensive agent.

β -aminobutyric acid. (3-aminobutanoic acid; β -amino-*n*-butyric acid).

Properties: Tasteless; water-soluble.

Hazard: Highly toxic.

α -aminocaproic acid. See norleucine.

aminocaproic lactam. See caprolactam.

aminocarb. (4-(dimethylamino)-3-methylphenol-methylcarbamate ester; methylcarbamate ester; 4-(dimethylamino)-*m*-tolyl ester; 4-dimethyl-amino-*m*-tolyl methylcarbamate; [4-(dimethylamino)-3-methylphenyl]*N*-methylcarbamate). $\text{C}_{11}\text{H}_{16}\text{N}_2\text{O}_2$

Properties: Tan; crystalline; slightly water-soluble; melting point 93-94C.

Hazard: Highly poisonous.

Use: Insecticide.

**1-(aminocarbonyl)propyl
(((methylamino)carbonyl)oxy)
ethanimidothioate.** *n*-

CAS: 92065-18-4. $\text{C}_8\text{H}_{15}\text{N}_3\text{O}_3\text{S}$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

aminochlorobenzene. See chloroaniline.

3-amino-5-chlorobenzoic acid.

CAS: 21961-30-8. $\text{C}_7\text{H}_6\text{ClNO}_2$.

Hazard: Low toxicity by ingestion.

4-amino-4'-chlorodiphenyl. $\text{C}_{12}\text{H}_{10}\text{ClN}$.

Properties: Crystalline solid. Mp 128C. Insoluble in water; soluble in acetone, benzene, glacial acetic acid, and alcohol.

Derivation: Chlorination of 4-nitrodiphenyl and reduction of the product with iron and hydrochloric acid in alcohol.

Use: Sulfur determination in various materials, e.g., rubber, coal, etc.

2-amino-4-chlorophenol. (*p*-chloro-*o*-aminophenol). $\text{C}_6\text{H}_3\text{OHNH}_2\text{Cl}$.

Properties: Light brown crystals. Mp 138C (decomposes).

Derivation: Reduction of *p*-chloro-*o*-nitrophenol.

Use: Intermediate.

2-amino-4-chlorotoluene. 5-chloro-2-methylaniline ($\text{NH}_2 = 1$); 4-chloro-*o*-toluidine ($\text{CH}_3 = 1$).

CAS: 95-69-2. $\text{ClNH}_2\text{C}_6\text{H}_3\text{CH}_3$.

Properties: Off-white solid or light-brown oil that tends to darken on storage. Mp 20-22C.

Hazard: Toxic by ingestion and inhalation. Probable carcinogen.

Use: Intermediate.

2-amino-5-chlorotoluene. $\text{ClNH}_2\text{C}_6\text{H}_3\text{CH}_3$.

Properties: Crystalline solid. Mp 26-27C. Sparingly soluble in water; soluble in dilute acids.

Use: Intermediate.

2-amino-6-chlorotoluene. 6-chloro-*o*-toluidine ($\text{CH}_3 = 1$); 3-chloro-2-methylaniline ($\text{NH}_2 = 1$). $\text{ClNH}_2\text{C}_6\text{H}_3\text{CH}_3$.

Properties: Liquid. Mp 0-2C.

Hazard: Toxic by ingestion or inhalation.

Use: Intermediate.

4-amino-2-chlorotoluene. 2-chloro-*p*-toluidine ($\text{CH}_3 = 1$); 3-chloro-4-methylaniline ($\text{NH}_2 = 1$).

CAS: 95-69-2. $\text{ClNH}_2\text{C}_6\text{H}_3$.

Properties: Liquid. Mp 21-24C.

Hazard: Probable carcinogen.

Use: Intermediate.

4-AMINO-2-CHLOROTOLUENE-5-SULFONIC 68

4-amino-2-chlorotoluene-5-sulfonic acid. (brilliant toning red amine; permanent red 2B amine). $\text{ClNH}_2\text{CH}_3\text{C}_6\text{H}_2\text{SO}_3\text{H}$.

Properties: White to buff powder. Essentially insoluble as free acid; soluble as sodium or ammonium salt.

Grade: 98.5% min purity.

Use: Intermediate for azo pigments.

5-amino-2-chlorotoluene-4-sulfonic acid. (lake red carbon amine). $\text{ClNH}_2\text{CH}_3\text{C}_6\text{H}_2\text{SO}_3\text{H}$.

Properties: White to pink powder. Essentially insoluble as free acid; soluble as sodium or ammonium salt.

Grade: 98.5% min purity.

Use: Intermediate for azo pigments.

***m*-amino-*p*-cresol methyl ether.** See 5-methyl-*o*-anisidine.

aminocyclohexane. See cyclohexylamine.

1-aminocyclopropane-1-carboxylase. (ACC synthase). An enzyme that catalyzes the rate limiting step in the ethylene biosynthetic pathway. It contributes significantly in the ripening of fruit. Plants generally bear a number of distinct ACC synthase genes that are differentially regulated in response to various developmental, environmental, and chemical factors.

***l*-amino-dehydrogenase.** See amino oxidase.

3-amino-2,5-dichlorobenzoic acid. See amiben.

2-amino-4,6-dichlorophenol. See 2,4-dichloro-6-aminophenol.

***p*-aminodiethylaniline.** (*N,N*-diethyl-*p*-phenylenediamine; diethylaminoaniline). $(\text{C}_2\text{H}_5)_2\text{NC}_6\text{H}_4\text{NH}_2$.

Properties: Liquid. Bp 260–262C. Insoluble in water; soluble in alcohol and ether.

Derivation: Treatment of diethylaniline with nitrous acid and subsequent reduction.

Hazard: See aniline.

Use: Dye intermediate, source of diazonium compounds in diazo copying process.

***p*-aminodiethylaniline hydrochloride.** $\text{C}_{10}\text{H}_{16}\text{N}_2\cdot\text{HCl}$.

Properties: Colorless needles. Soluble in water and alcohol; insoluble in ether.

Hazard: See aniline.

Use: Color photography.

2-amino-4,6-dihydroxypteridine. See xanthopterin.

***p*-aminodimethylaniline.** (dimethylaminoaniline; dimethyl-*p*-phenylenediamine). $(\text{CH}_3)_2\text{NC}_6\text{H}_4\text{NH}_2$.

Properties: Colorless; asbestos-like needles; stable in air when pure. If impure, the crystals liquefy. Mp 41C, bp 257C. Soluble in water, alcohol, and benzene.

Derivation: By reduction of *p*-nitrosodimethylaniline with zinc dust and hydrochloric acid.

Method of purification: Recrystallization from mixture of benzene and ligroin.

Hazard: Toxic by ingestion or inhalation of vapor.

Use: Base for production of methylene blue, photodeveloper, reagent for detection of hydrogen sulfide, reagent for cellulose, organic synthesis, reagent for certain bacteria.

3-amino-*n*-(2-(dimethylamino)ethyl)naphthalimide. See nafidimide.

aminodimethylbenzene. See xylidine.

2-amino-4,6-dimethylpyridine. $(\text{CH}_3)_2\text{C}_5\text{H}_2\text{NNH}_2$.
Properties: Solid. Mp 65.2–68.5C, bp 235C. Water soluble.

Derivation: Prepared from 2-aminopyridine.

Use: Organic intermediate.

2-amino-4,6-dinitrophenol. See picramic acid.

***p*-aminodiphenyl.** (4-aminodiphenyl; *p*-xenyamine).

CAS: 92-67-1. $\text{C}_6\text{H}_5\text{C}_6\text{H}_4\text{NH}_2$.

Properties: Colorless crystals. Mw 169.23, mp 53C, bp 302C.

Hazard: Toxic by ingestion, inhalation, skin absorption. Confirmed carcinogen. Bladder and liver cancer.

Use: Organic research.

***p*-aminodiphenylamine.** (*N*-phenyl-*p*-phenylenediamine). $\text{NH}_2\text{C}_6\text{H}_4\text{NHC}_6\text{H}_5$.

Properties: Purple powder. Mp 75C. Insoluble in water; soluble in alcohol and acetone.

Derivation: Reduction of the coupling product of diazotized sulfanilic acid and diphenylamine.

Use: Dye intermediate, pharmaceuticals, photographic chemicals.

4-aminodiphenylamine-2-sulfonic acid. (5-amino-2-anilinobenzenesulfonic acid). $\text{C}_6\text{H}_5\text{NHC}_6\text{H}_3\text{NH}_2\text{SO}_3\text{H}$.

Properties: Needle like crystals. Barely soluble in water.

Derivation: From *p*-nitrodiphenylamine-*o*-sulfonic acid by reduction with iron and hydrochloric acid.

Use: Synthesis of dyestuffs.

aminodithioformic acid. See dithiocarbamic acid.

aminoethane. See ethylamine.

2-aminoethanesulfonic acid. See taurine.

2-aminoethanethiol. (cysteamine; mercaptamine; thioethanolamine).

CAS: 60-23-1. $\text{HSCH}_2\text{CH}_2\text{NH}_2$.

Properties: Crystals with unpleasant odor. Oxidizes on contact with air. Mp 97C. Soluble in water. Combustible.

Use: Medicine (believed to offer protection against radiation).

1-aminoethanol. See aldehyde ammonia.

2-aminoethanol. See ethanolamine.

2-(2-aminoethoxy)ethanol. (Diglycolamine; DGA).

CAS: 929-02-6. $\text{NH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$.

Properties: Colorless, slightly viscous liquid; mild amine odor. Bp 221C, d 1.0572 (20/20C), flash p 260F (126.6C), fp -12.5C. Miscible with water and alcohols. Combustible.

Hazard: Strong irritant to tissue.

Use: Removal of acid components from gases, especially carbon dioxide and hydrogen sulfide from natural gas; intermediate.

4-amino-*n*-(6-ethoxy-3-pyridazinyl)benzenesulfonamide. See sulfaethoxy-pyridazine.

aminoethoxyvinylglycine.

Use: Inhibitor of ethylene biosynthesis in plants.

1-[(aminoethyl)amino]-2-propanol.

$\text{C}_5\text{H}_{14}\text{N}_2\text{O}$.

Properties: Thick, colorless liquid. Bp 112C (11 mm Hg), d 0.984, refr index 1.743. Slight odor of ammonia.

Use: Curing epoxy resins.

3-amino-9-ethylcarbazole. (3-amino-*N*-ethylcarbazole hydrochloride; 9-ethylcarbazol-3-amine).

CAS: 132-32-1. $\text{C}_{14}\text{H}_{14}\text{N}_2$. A hydrochloride salt and free amine solid compound.

Hazard: Questionable carcinogen; poison.

4-(2-aminoethyl)diethylenetriamine. See 2,2',2''-nitrilotris(ethylamine).

aminoethylethanolamine. See hydroxyethylethylenediamine.

4-aminoethylglyoxaline. See histamine.

4-(2-aminoethyl)imidazole. See histamine.

2-aminoethylisothiuronium diacetate.

CAS: 63680-10-4. $\text{C}_3\text{H}_9\text{N}_3\text{S}\cdot 2\text{C}_2\text{H}_4\text{O}_2$.

Hazard: Moderately toxic.

β -aminoethylisothiurea dihydrobromide.

(2-(2-aminoethyl)-2-thiopseudourea dihydrobromide; AET). $\text{C}_3\text{H}_9\text{N}_3\text{S}\cdot 2\text{HBr}$.

Properties: Crystals, hygroscopic. Mp 194–195C.

Derivation: Thiourea is refluxed with 2-bromoethylamine hydrobromide in isopropanol.

Use: Enzyme activator, free radical detoxifier (believed to offer protection against radiation).

4-(1-aminoethyl)phenol.

CAS: 134855-87-1. $\text{C}_8\text{H}_{11}\text{NO}$.

Hazard: A severe eye irritant.

***N*-aminoethylpiperazine.**

CAS: 140-31-8.

$\text{H}_2\text{NC}_2\text{H}_4\text{NCH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2$.

An amine combining a primary, secondary, and tertiary amine in one molecule.

Properties: Liquid. D 0.9837, bp 222.0C, flash p 200F (93.3C), fp 17.6C. Soluble in water. Combustible.

Hazard: Strong irritant to tissue.

Use: Epoxy curing agent, intermediate for pharmaceuticals, anthelmintics, surface-active agents, synthetic fibers.

2-amino-2-ethyl-1,3-propanediol. (AEPD; aminoamylene glycol). $\text{CH}_2\text{OHC}(\text{C}_2\text{H}_5)\text{NH}_2\text{CH}_2\text{OH}$.

Properties: Solid or viscous liquid. Mp 38C. Soluble in water and alcohol.

Use: Emulsifying agent (in soap form) for oils, fats, and waxes, absorbent for acidic gases CO_2 and H_2S , organic synthesis.

***s*-(2-aminoethyl) phosphorothioate.**

CAS: 5746-40-7. $\text{C}_2\text{H}_8\text{NO}_3\text{PS}$.

Hazard: A reproductive hazard.

2-aminoethylsulfuric acid. $\text{NH}_2\text{CH}_2\text{CH}_2\text{OSO}_3\text{H}$.

Properties: White, crystalline powder; noncorrosive. Mp 274–280C; sinters at 274C and darkens without complete melting at 280C; d 1.782; bulk d 1.007. Soluble in water; insoluble in most organic solvents; pH (1% aqueous solution) 4.0 (20C), (5% aqueous solution) 3.3 (39C).

Use: Organic synthesis of ethyleneimine and various other compounds, amination of cotton.

3-amino- α -ethyl-2,4,6-triiodohydrocinnamic acid. See iopanoic acid.

4-aminofolic acid. See aminopterin.

aminoform. See hexamethylenetetramine.

***N*-[*p*-[(2-amino-5-formyl-5,6,7,8-tetrahydro-4-hydroxy-6-pteridiny)methyl]amino]benzoyl]glutamic acid.** (folinic acid; (2S)-2-{[4-{[2-amino-5-formyl-4-oxo-1,6,7,8-tetrahydropteridin-6-yl]methylamino}benzoyl]amino}

peacid; leucovorin).

AMINO-G ACID

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CAS: 58-05-9. $C_{20}H_{23}N_7O_7$. A calcium salt.
Use: Antidote to folic acid antagonists.

amino-G acid. (2-naphthylamine-6,8-disulfonic acid; 7-amino-1,3-naphthalene-disulfonic acid).
 $C_{10}H_5(NH_2)(SO_3H)_2$.

Properties: White, crystalline solid. Soluble in water.

Derivation: (1) Form G acid by heating sodium salt with ammonia and sodium bisulfite solution in an autoclave under pressure. (2) Sulfonation by β -naphthylamine.

Use: Azo dye intermediate.

α -aminoglutaric acid. See glutamic acid.

amino-4-guanidovaleric acid. See arginine.

7-aminoheptanenitrile.

CAS: 23181-80-8. $C_7H_{14}N_2$.

Hazard: Moderately toxic by ingestion.

aminohexamethyleneimine.

Properties: Liquid. Bp 170C. Soluble in water and most organic solvents. Combustible.

Use: Intermediate for dyes, pharmaceuticals, and photographic chemicals.

2-aminohexanoic acid. See norleucine.

6-aminohexanoic acid. See norleucine.

***p*-aminohippuric acid.** [*N*-(*p*-aminobenzoyl) glycine; PAHA]. $NH_2C_6H_4CONHCH_2COOH$.

Properties: White, crystalline powder. Discolors on exposure to light. Soluble in alcohol and most organic solvents. Very soluble in dilute hydrochloric acid and alkalis. Forms a water-soluble sodium salt. Mp 197–199C.

Grade: USP.

Use: Medicine (diagnostic agent), intermediate.

aminohydroxybenzoic acids. See aminosalicic acids.

4-amino-1-hydroxybutane-1,1-diyldiphosphonic acid.

CAS: 66376-36-1. $C_4H_{13}NO_7P_2$.

Hazard: A reproductive hazard.

α -amino- β -hydroxybutyric acid. See threonine.

2-amino-2-hydroxymethyl-1,3-propanediol.

See tris(hydroxymethyl)aminomethane.

α -amino- β -hydroxypropionic acid. See serine.

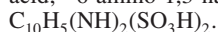
6-amino-*n*-hydroxy-3-pyridinecarboxamide.

See 6-aminonicotinohydroxamic acid.

α -amino- β -imidazolepropionic acid. See histidine.

α -aminoisocaproic acid. See leucine.

α -aminoisovaleric acid. See valine.

amino-J acid. (2-naphthylamine-5,7-disulfonic acid; 6-amino-1,3-naphthalene-disulfonic acid).

Properties: Crystallizes in white lustrous leaflets from water and in long needles from hydrochloric acid solution.

Derivation: By sulfonation of either 2-naphthylamine-5-sulfonic acid or 2-naphthylamine-7-sulfonic acid.

Use: Azo dye intermediate.

2-amino-6-mercaptapurine.

Use: Pharmaceutical end product for treatment of leukemia.

aminomercuric chloride. See mercury, ammoniated.

aminomethane. See methylamine.

3-amino-4-methoxybenzanilide.

Properties: Gray powder.

Use: Dyes, pharmaceuticals, and other organic chemicals.

1-amino-2-methoxy-5-methylbenzene. See 5-methyl-*o*-anisidine.

***m*-(4-amino-3-methoxyphenylazo) benzenesulfonic acid.** $H_2NC_6H_3(OCH_3)NNC_6H_4SO_3H$.

Properties: Maroon paste containing approximately 38% solids.

Use: Intermediate.

4-aminomethyl-1-benzylpyrrolidin-2-one fumarate (2:1).

CAS: 97205-35-1. $C_{24}H_{32}N_4O_2 \cdot C_4H_4O_4$.

Hazard: Moderately toxic by ingestion.

3-amino-3-methyl-1-butyne. See 2-methyl-3-butyne-2-amine.

4-amino-4'-methylidiphenylamine-2-sulfonic acid. (aminotoluidinobenzenesulfonic acid).

Properties: Light to dark gray paste with characteristic odor.

Use: Intermediate.

- 4-amino-10-methylfolic acid.** See methotrexate.
- 3-amino-5-methylisoxazole.**
Use: Analog of the nucleic acid constituent guanine.
- 2-amino-1-methyl-2-oxoethyl-*n*-(((methylamino)carbonyloxy)ethanimidothioate.**
 CAS: 92065-77-5. $C_7H_{13}N_3O_3S$.
Hazard: A poison by ingestion.
Use: Agricultural chemical.
- 2-amino-3-methylpentanoic acid.** See isoleucine.
- 2-amino-4-methyl-5-phosphono-3-pentenoic acid.**
 CAS: 137424-81-8. $C_6H_{12}NO_5P$.
Hazard: A poison.
- 2-amino-2-methyl-1,3-propanediol.** (AMPD; aminobutylene glycol; butanediolamine). $CH_2OCH(CH_3)NH_2CH_2OH$.
Properties: Colorless crystals. Mp 110C. Soluble in water and alcohol. Corrosive to copper, brass, and aluminum.
Use: Emulsifying agent (in soap form) for oils, fats, and waxes; absorbent for acidic gases; organic synthesis; cosmetics.
- 2-amino-2-methyl-1-propanol.** (isobutanolamine; AMP). $CH_3(CH_3)NH_2CH_2OH$.
Properties: Solid or viscous liquid. Mp 30C, bp 165C, d 0.93, refr index 1.45.
Hazard: Toxic by ingestion.
Use: Emulsifying agent (in soap form) for oils, fats, and waxes, absorbent for acidic gases, organic synthesis, cosmetics.
- 2-amino-3-methylpyridine.** (2-amino-3-picoline).

$$\overline{\hspace{1.5cm}}$$
 $N:C(NH_2)C(CH_3):CHCH:CH$
Properties: Liquid. Bp 221C, mp 29.5–33.3C. Soluble in water.
Derivation: From 2-aminopyridine.
Hazard: Toxic by ingestion.
Use: Intermediate.
- 2-amino-4-methylpyridine.** (2-amino-4-picoline).

$$\overline{\hspace{1.5cm}}$$
 $N:C(NH_2)CH:C(CH_3)CH:CH$
Properties: Crystals. Bp 230.9C (115–117C at 11 mm), mp 96–99.0C. Sublimes on slow heating. Soluble in water and lower alcohols.
Derivation: Prepared from 2-aminopyridine.
Use: Intermediate, medicine.
- 2-amino-5-methylpyridine.** (2-amino-5-picoline).

$$\overline{\hspace{1.5cm}}$$
 $N:C(NH_2)CH:CHC(CH_3):CH$
Properties: Crystals. Bp 227.1C, mp 76.6C. Soluble in water.
Derivation: Prepared from 2-aminopyridine.
Use: Intermediate.
- 2-amino-6-methylpyridine.** (2-amino-6-picoline).

$$\overline{\hspace{1.5cm}}$$
 $N:C(NH_2)CH:CHCH:C(CH_3)$
Properties: Crystals. Bp 214.4C, mp 43.7C. Soluble in water.
Derivation: Prepared from 2-aminopyridine.
Use: Intermediate.
- 2-amino-4-(methylthio)butyric acid.** See methionine.
- α -amino- β -methylvaleric acid.** See isoleucine.
- α -amino- γ -methylvaleric acid.** See leucine.
- dl*-2-amino-3-methylvaleric acid.** See *dl*-isoleucine.
- aminonaphthalenesulfonic acid.** See naphthylaminesulfonic acid.
- aminonaphthol.**
Derivation: From nitronaphthols by reduction.
- 4-amino-1-naphthol.** (4-hydroxy- α -naphthylamine). $C_{10}H_9NO$.
Properties: Acicular crystals. Soluble in water.
Derivation: Rearrangement of α -naphthylhydroxylamine in acetone.
Use: Inhibitor of polymerization, chemical intermediate. Must be kept dry during storage to avoid oxidation and discoloration.
- aminonaphtholsulfonic acid.** Any of several sulfonated aromatic acids derived from naphthol or naphthylamine and used as azo dye intermediates.
- 6-aminonicotinic acid.** (6-aminopyridine-3-carboxylic acid). $C_6H_6N_2O_2$.
Properties: Crystals. Mp decomposes above 300C.
- 6-aminonicotinohydroxamic acid.**
 CAS: 76706-59-7. $C_6H_7N_3O_2$.
Hazard: A poison by ingestion.
Use: Agricultural chemical.
- amino oxidase.** (L-amino acid oxidase; D-amino acid oxidase; L-amino dehydrogenase). An enzyme that catalyzes the deamination of α -amino acids by

2-AMINO-2-OXOETHYL-2,2-DIMETHYL 72

dehydrogenation to keto acids and ammonia. Two types are recognized, acting on the D- and L-amino acids. Recent emphasis has been on characterization of the D-amino oxidase, which is known to contain the flavin isoalloxazine as coenzyme. Both types are found in animal tissue, especially in liver and kidney, as well as in snake venom and certain bacteria.

2-amino-2-oxoethyl-2,2-dimethyl-*n*-(((methylamino)carbonyl)oxy)propanimidothioate.

CAS: 92065-91-3. $C_9H_{17}N_3O_3S$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

2-amino-2-oxoethyl-*n*-(((methylamino)carbonyl)oxy)ethanimidothioate.

CAS: 92065-82-2. $C_6H_{11}N_3O_3S$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

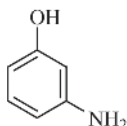
2-amino-6-oxypurine. See guanine.

1-aminopentane. See *n*-amylamine.

2-aminophenetole. See *o*-phenetidine.

4-aminophenetole. See *p*-phenetidine.

***m*-aminophenol.** (*m*-hydroxyaniline).
CAS: 591-27-5. $C_6H_4NH_2OH$.



Properties: White crystals. Mp 122C. Soluble in water, alcohol, and ether.

Derivation: Fusion of *m*-sulfanilic acid with caustic soda and subsequent extraction of the melt with ether.

Hazard: Toxic by ingestion.

Use: Dye intermediate, intermediate for *p*-aminosalicylic acid.

***o*-aminophenol.** (*o*-hydroxyaniline).
CAS: 95-55-6. $C_6H_4NH_2OH$.

Properties: White crystals; turn brown with age. Mp 172–173C, sublimes on further heating. Soluble in cold water, alcohol, benzene; freely soluble in ether.

Derivation: By reduction of *o*-nitrophenol mixed with aqueous ammonia by means of a stream of hydrogen sulfide. Also available as the hydrochloride.

Grade: Technical, 99% min.

Use: Dyeing furs and hair; dye intermediate for azo and sulfur dyes; pharmaceuticals.

***p*-aminophenol.** (*p*-hydroxyaniline).

CAS: 123-30-8. $C_6H_4NH_2OH$.

Properties: White or reddish-yellow crystals turn violet on exposure to light. Mp 184C (decomposes). Soluble in water and alcohol.

Derivation: (1) By reduction of *p*-nitrophenol with iron filings and hydrochloric acid; (2) by electrolytic reduction of nitrobenzene in concentrated sulfuric acid and treatment with an alkali to free the base. Also available as the hydrochloride.

Grade: Technical, photographic.

Use: Dyeing textiles, hair, furs, feathers, photographic developer, pharmaceuticals, antioxidants, oil additives.

4-amino-1-phenol-2,6-disulfonic acid. $C_6H_2OHNH_2(SO_3H)_2$.

Properties: Fine needles. Soluble in water; slightly soluble in alcohol; insoluble in ether.

Derivation: Action of sulfur dioxide on *p*-nitrophenol.

Use: Dyes.

2-amino-1-phenol-4-sulfonic acid. (*o*-amino-phenol-*p*-sulfonic acid). $C_6H_3OHNH_2SO_3H$.

Properties: Brown crystals, No mp. Decomposes on heating. Fairly soluble in hot water, very soluble in alkaline solution.

Derivation: (1) Sulfonation and nitration of chlorobenzene followed by hydrolysis to phenol with caustic soda with subsequent reduction by sodium sulfide. (2) Sulfonation of *o*-aminophenol. (3) Sulfonation of phenol followed by nitration and reduction.

Use: Intermediate for dyes.

***p*-aminophenylarsonic acid.** See arsanilic acid.

***m*-aminophenylboronic acid hemisulfate.**

(3-aminobenzeneboronic acid). $H_2NC_6H_4B(OH)_2 \cdot 1/2H_2SO_4$.

Properties: Mw 186, mp above 300C.

Use: Adsorbent additive for the chromatographic separation of 3'-terminal polynucleotides from RNA.

1-amino-2-phenylethane. See 2-phenylethylamine.

***o*-aminophenylglyoxalic lactim.** See isatin.

***p*-aminophenylmercaptoacetic acid.** $NH_2C_6H_4SCH_2CO_2H$.

Properties: Mp 186–187C. Insoluble in water, alcohol, benzene, chloroform; soluble in aqueous acid or alkali solutions.

Use: Synthetic intermediate for dyes and pharmaceuticals.

73 γ -AMINOPROPYLTRIMETHOXYSILANE**2-(*p*-aminophenyl)-6-methylbenzothiazole.**

See dehydrothio-*p*-toluidine.

***m*-aminophenyl methyl carbinol.**

$\text{NH}_2\text{C}_6\text{H}_4\text{CH}(\text{OH})\text{CH}_3$.

Properties: Solid. D 1.12, bp 217.3C (100 min), mp 66.4C, flash p 315F (157C). Soluble in water. Combustible.

Use: Carrier for dyeing synthetic fibers; intermediate for perfume, chemicals, and pharmaceuticals.

1-(*m*-aminophenyl)-3-methyl-5-pyrazolone.

$\text{NH}_2\text{C}_6\text{H}_4\text{NNC}(\text{CH}_3)\text{CH}_2\text{CO}$.

Properties: Light tan paste containing approximately 45% solids.

Use: Intermediate.

aminophenylnorharman.

CAS: 219959-86-1. $\text{C}_{17}\text{H}_{13}\text{N}_3$.

Hazard: A poison by ingestion.

1-amino-2-phenylpropane. See 2-phenylpropylamine. **α -amino- β -phenylpropionic acid.** See phenylalanine.**aminopherase.** See transaminase.**aminophylline.** (3,7-dihydro-1,3-dimethyl-1H-purine-2,6-dione compounded with 1,2-ethanediamine (2:1)). $\text{C}_{16}\text{H}_{24}\text{N}_{10}\text{O}_4$.

Properties: White or slightly yellowish granular powder; slight ammonia odor; bitter taste. Mw 420.44.

Derivation: Prepared from theophylline and aqueous ethylenediamine.

Hazard: Cardiovascular and respiratory collapse.

Use: Small animal muscle relaxant for heaves in horses, and diuretic in dogs with congestive heart failure.

aminopicoline. See aminomethylpyridine.**aminoplast resin.** (amino resin). A class of thermosetting resins made by the reaction of an amine with an aldehyde. The only such aldehyde in commercial use is formaldehyde, and the most important amines are urea and melamine.

Use: Molding, adhesives, laminating, textile finishes, permanent-press fabrics, wash-and-wear apparel fabrics, protective coatings, paper manufacture, leather treatment, binders for fabrics, foundry sands, graphite resistors, plaster-of-paris fortification, foam structures, and ion-exchange resins.

See dimethylol urea; methylol urea; melamine resin; urea-formaldehyde resin.

2-aminopropane. See isopropylamine.**2-aminopropanoic acid.** See alanine.**3-aminopropanoic acid.** See β -alanine.**1-amino-2-propanol.** See isopropanolamine.**2-amino-1-propanol.** (2-aminopropyl alcohol; β -propanolamine). $\text{CH}_3\text{CH}(\text{NH}_2)\text{CH}_2\text{OH}$.

Properties: Colorless to pale yellow liquid. Both *l* and *dl* forms are available. *dl*-Form: fish odor. Bp 173–176C. Freely soluble in water, alcohol, ether. *l*-Form: refr index 1.4480–1.4495 (26C), distillation range approximately 114C at 100 mm Hg. Combustible.

Use: Organic synthesis and chemical intermediate.

3-amino-1-propanol. (propanolamine).

$\text{H}_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{OH}$.

Properties: Colorless liquid. Mp 12.4C, bp 184–186C (168C), flash p 175F (79.4C), d 0.9786 (30C). Miscible with alcohol, water, acetone, and chloroform. Combustible.

Grade: 99% pure.

Hazard: Irritant to tissue.

Use: Organic intermediate.

3-aminopropionitrile. $\text{H}_2\text{NCH}_2\text{CH}_2\text{CN}$.

Properties: Colorless liquid. Bp 185C, refr index 1.44. May polymerize if stored in presence of air.

Derivation: Reaction of acrylonitrile with ammonia.

Use: Production of β -alanine and pantothenic acid.

2-aminopropyl alcohol. See 2-amino-1-propanol.***N*-aminopropylmorpholine.** (4-(3-aminopropyl)morpholine).

$\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{NC}_3\text{H}_6\text{NH}_2$.

Properties: Colorless liquid. D 0.9872 (20/20C), bp 224.5C, flash p 220F (104.4C) (OC), fp –15C. Soluble in water and alcohol. Combustible.

Hazard: Strongly irritant to tissue.

Use: Fiber synthesis; chemical intermediate.

***n*-(3-aminopropyl)-1,3-propanediamine polymer with (chloromethyl)oxirane.**

CAS: 51961-45-6. $(\text{C}_6\text{H}_{17}\text{N}_3\cdot\text{C}_3\text{H}_5\text{ClO})_x$.

Hazard: A severe eye irritant.

(3-aminopropyl)triethylsilane.

CAS: 17887-09-1. $\text{C}_9\text{H}_{23}\text{NSi}$.

Hazard: A poison.

 γ -aminopropyltrimethoxysilane.

$\text{NH}_2(\text{CH}_2)_3\text{Si}(\text{OCH}_3)_3$.

Properties: 100% active, water-white liquid. D 1.01; refr index 1.42.

Use: Glass fabric sizing, binder, adhesion promoter.

AMINOPTERIN

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aminopterin. (4-aminofolic acid; aminopteroyl-glutamic acid). $C_{19}H_{20}N_8O_5 \cdot 2H_2O$. Differs slightly in structure from folic acid and antagonizes the utilization of folic acid by the body, an antimetabolite. **Properties:** Occurs as clusters of yellow needles that are soluble in aqueous sodium hydroxide solutions. **Use:** Medicine, rodenticide.

aminopteroylglutamic acid. See aminopterin.

aminopurine. (2-aminopurine; 1-H-purin-2-amine; SQ 22451). $C_5H_5N_5$. An analog of adenine that pairs with cytosine. **Properties:** Crystals from water. **Hazard:** Mutagen.

6-aminopurine. See adenine.

2-aminopyridine. (α -pyridylamine). CAS: 504-29-0. $C_5H_4NNH_2$. **Properties:** White leaflets or large colorless crystals. Fp 58.1C; bp 210.6C. Soluble in water, alcohol, benzene, ether. **Hazard:** Toxic. **Use:** Intermediate for antihistamines and other pharmaceuticals.

3-aminopyridine. (β -pyridylamine). $C_5H_4NNH_2$. **Properties:** White crystals. Mp 64C; bp 250–252C. Soluble in water, alcohol, benzene, ether. **Use:** Intermediate in preparation of drugs and dyestuffs.

4-aminopyridine. CAS: 504-24-5. $C_5H_4NNH_2$. **Properties:** Crystals. Mp 158.9C, bp 273.5C. Soluble in water. **Derivation:** From 2-aminopyridine. **Grade:** 95% (minimum). **Use:** Intermediate.

3-amino-pyridine-2-carboxaldehyde. CAS: 143621-35-6. $C_7H_9N_3S$. **Hazard:** A poison.

3-aminopyridine-2-carboxaldehyde thiosemicarbazone. See 3-amino-pyridine-2-carboxaldehyde.

4-aminosalicylic acid. (PASA; PAS; *p*-aminosalicylic acid; 4-amino-2-hydroxybenzoic acid). CAS: 65-49-6. $NH_2C_6H_3(OH)COOH$. **Properties:** White or nearly white bulky powder. Odorless or has slight acetous odor. Mp 150–151C (decomposes). Affected by light and air. Darkened solutions should not be used. Soluble in dilute sodium hydroxide and dilute nitric acid, slightly soluble in ether; practically insoluble in benzene. Water solutions decompose with evolution of carbon dioxide.

Derivation: From *m*-aminophenol and potassium bicarbonate, soluble under pressure. **Grade:** USP. **Use:** Medicine, industrial preservative.

5-aminosalicylic acid. (*m*-aminosalicylic acid; 5-amino-2-hydroxybenzoic acid). CAS: 89-57-6. $NH_2C_6H_3(OH)COOH$.

Properties: White crystals, sometimes pinkish. Mp 260–280C (decomposes). Soluble in hot water or alcohol.

Derivation: From the corresponding nitrosalicylic acid by reduction. **Use:** Dyes, intermediate.

α -aminosuccinamic acid. See asparagine.

***l*- α -aminosuccinamic acid.** See *l*-asparagine.

aminosuccinic acid. See aspartic acid.

***dl*-aminosuccinic acid.** See *dl*-aspartic acid.

amino sugar. Any of a class of monosaccharides in which an alcoholic hydroxyl group has been replaced by an amino group.

aminotetrazole. (5-aminotetrazole; 5-amino-1h-tetrazole; 1h-tetrazol-5-amine). CAS: 4418-61-5. CH_3N_5 . **Properties:** Crystals. Mp: 206C (decomp), mw: 85.09. **Hazard:** Moderately toxic. An unstable material; explodes with KOH.

5-aminotetrazole. See aminotetrazole.

amino-terminal residue. The amino acid residue in a polypeptide chain which has a free alpha-amino group.

5-amino-1h-tetrazole. See aminotetrazole.

2-aminothiazole. (2-thiazylamine). $SCHCHNCNH_2$. **Properties:** Light-yellow crystals. Mp 90C, distills at 3 mm without decomposition. Slightly soluble in cold water, alcohol, and ether; soluble in hot water and dilute mineral acids.

Derivation: Chlorination of vinyl acetate and condensation with thiourea.

Use: Intermediate in synthesis of sulfathiazole, medicine (thyroid inhibitor).

α -amino- β -thiolpropionic acid. See cysteine.

aminothiourea. See thiosemicarbazide.

aminotoluene. See *o*-toluidine; *m*-toluidine; *p*-toluidine; benzylamine.

aminotransferases. Enzymes that catalyze the transfer of amino groups from α -amino to α -keto acids; commonly called transaminases.

6-amino-*s*-triazine-2,4-diol. See ammelide.

aminotriazole. (amitrole; 3-amino-1,2,4-triazole; 3-amino-1H-1,2,4-triazole; 1,2,4-triazol-3-ylamine; ata).

CAS: 61-82-5. $C_2H_4N_4$. A powerful plant growth suppressant and cotton defoliant that is readily absorbed by leaves and roots. It inhibits many aspects of growth and differentiation including cell division in the primary root meristems in some plants.

Properties: Colorless, crystalline solid; soluble in water and ethanol.

Hazard: Toxic; carcinogen.

Use: Herbicide banned in the U.S. in 1971.

3-amino-1,2,4-triazole. (amitrole).

CAS: 61-82-5.

$NHNC(NH_2)NCH$.

Properties: White, crystalline solid. Mp 156–159C. Soluble in water and alcohol.

Hazard: Use on food crops not permitted. Questionable carcinogen.

Use: Herbicide, defoliant.

4-amino-3,5,6-trichloropicolinic acid. See picloram.

3-(3-amino-2,4,6-triiodophenyl)-2-ethylpropanoic acid. See iopanoic acid.

aminourea hydrochloride. See semicarbazide hydrochloride.

Amino Vital Fast Charge. Pharmaceutical grade amino acids drink powders.

Amino Vital Mix and Shake. Pharmaceutical grade amino acids drink powders.

Amino Vital RTD Drink. Pharmaceutical grade amino acids drink powders.

“Aminox” [Chemtura]. TM for a low-temperature reaction product of diphenylamine and acetone.

Properties: Light-tan powder. D 1.13, mp 85–95C. Soluble in acetone, benzene, and ethylene dichloride; insoluble in water and gasoline.

Use: Antioxidant for nylon and light-colored rubber products.

aminoxylene. See xylidine.

amiton. (*s*-[2-(diethylamino)ethyl]phosphorothioic acid *o,o*-diethyl ester; *o,o*-diethyl *s*-(β -diethylamino)ethylphosphorothiolate;

2-diethoxyphosphorylsulfanyl-*N,N*-diethylethanamine). $C_{10}H_{24}NO_3PS$

Hazard: Extremely toxic contact insecticide and miticide; a cholinesterase inhibitor.

amitrole. Generic name for 3-amino-1,2,4-triazole.

amlodipine.

CAS: 88150-42-9. $C_{20}H_{25}ClN_2O_5$.

Hazard: Human systemic effects.

amlure. See propyl 1,4-benzodioxan-2-carboxylate.

Ammate. Ammonium sulfamate in various grades.

Hazard: See ammonium sulfamate.

Use: Nonselective herbicide.

ammelide. (6-amino-*s*-triazine-2,4-diol; cyanuramide).

$NC(OH)NC(OH)NC(NH_2)$.

Properties: Crystalline solid. Mp (decomposes). Insoluble in alcohol; slightly soluble in hot water. Similar to melamine and suggested for melamine-type (amino) resins.

ammeline. (4,6-diamino-*s*-triazine-2-ol; cyanurdiamide).

$NC(OH)NC(NH_2)NC(NH_2)$.

Properties: Crystalline solid. Mp decomposes. Insoluble in water and alcohol. A compound similar to melamine.

Use: In melamine-type resins and in special high-temperature lubricants.

ammine. A coordination compound formed by the union of ammonia with a metallic substance in such a way that the nitrogen atoms are linked directly to the metal. Note the distinction from amines in which the nitrogen is attached directly to the carbon atom.

See cobaltamine; coordination compound.

ammonia, anhydrous.

CAS: 7664-41-7. NH_3 .

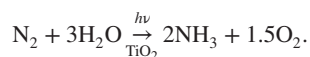
Properties: Colorless gas (or liquid); sharp, intensely irritating odor; lighter than air; easily liquefied by pressure. Bp $-33.5C$, fp $-77C$, vap press of liquid 8.5 atm (20C), sp vol 22.7 cu ft/lb (70C), d (liquid) 0.77 at 0C and 0.6819 at bp. Very soluble in water, alcohol, and ether. Autoign temp 1204F (650C). Combustible. *Note:* Ammonia is the first complex molecule to be identified in interstellar space. It has been observed in galactic dust clouds in the Milky Way and is believed to constitute the rings of the planet Saturn.

AMMONIA, AROMATIC SPIRITS

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Derivation: From synthesis gas, a mixture of carbon monoxide, hydrogen, carbon dioxide, and nitrogen (from air) obtained by steam reforming or by partial combustion of natural gas (U.S.), or from the action of steam on hot coke (Haber-Bosch process). The latter method is used in South Africa. After removal of the carbon oxides, the gas composition is adjusted to a ratio of three parts H₂ to one part N₂ and passed to the synthesis unit over a catalyst at pressures of about 300 atm and temperature of approximately 500C. The catalyst most widely used is produced by fusion of iron oxide (Fe₃O₄) containing aluminum oxide and potassium oxide as promoters, followed by reduction of the oxide. Chemisorption of the nitrogen on the catalyst surface is the rate-controlling step.

Other methods include use of refinery off-gases, coke-oven gas, electrolytic hydrogen, and calcium cyanamide. Ammonia has been made experimentally using solar energy to activate the reaction



Ammonia is formed as an end product of animal metabolism by decomposition of uric acid.

Grade: Commercial 99.5%, refrigerant 99.97%.

Hazard: Inhalation of concentrated fumes may be fatal. Moderate fire risk, explosive limits in air 16–25%. Forms explosive compounds in contact with silver or mercury. Eye damage and upper respiratory tract irritant.

Use: Fertilizers, either as such or in the form of compounds, e.g., ammonium nitrate; manufacture of nitric acid, hydrazine hydrate, hydrogen cyanide, urethane, acrylonitrile, and sodium carbonate (by Solvay process); refrigerant; nitriding of steel; condensation catalyst; synthetic fibers; dyeing; neutralizing agent in petroleum industry; latex preservative; explosives; nitrocellulose; ureaformaldehyde; nitroparaffins; melamine; ethylenediamine; sulfite cooking liquors; fuel cells; rocket fuel; yeast nutrient; developing diazo films.

See ammonium hydroxide; Haber, Fritz; synthesis gas.

ammonia, aromatic spirits. A mixture of 10% of ammonia in alcohol. Strong, suffocating odor.

Hazard: Irritant to mucous membranes. Flammable, keep tightly sealed.

Use: Medicine (respiratory stimulant).

ammonia-soda process. See Solvay process.

ammoniated glycyrrhizin.

CAS: 1407-03-0.

Properties: From roots of *Glycyrrhiza glabra*.

Use: Food additive.

ammoniated mercury chloride. See mercury, ammoniated.

ammoniated ruthenium oxychloride. See ruthenium red.

ammoniated superphosphate. Fertilizer produced by mixing ammonia with superphosphate in the ratio of 5 parts to 100.

ammonia water. (ammonia solution; ammonium hydroxide; aqueous ammonia; household ammonia; aqua ammonia; aqua ammoniac; azanium hydroxide).

CAS: 1336-21-6. H₃NO. The hydroxy salt of ammonium ion.

Properties: Highly volatile, extremely irritant liquid.

Derivation: Formed when ammonia reacts with water molecules in solution.

Hazard: Irritant; poison; burns.

Use: All-purpose cleaner; cleaner used in dry cleaning.

ammonio-cupric sulfate. See copper sulfate, ammoniated.

ammonio-ferric oxalate. See ferric ammonium oxalate.

ammonio-ferric sulfate. See ferric ammonium sulfate.

ammonium acetate.

CAS: 631-61-8. NH₄(C₂H₃O₂).

Properties: White, deliquescent, crystalline mass.

Mp 114C, d 1.073. Soluble in water and alcohol.

Mp 114C, d 1.073. Combustible.

Derivation: By the interaction of glacial acetic acid and ammonia.

Use: Reagent in analytical chemistry, drugs, textile dyeing, preserving meats, foam rubbers, vinyl plastics, explosives.

ammonium acid carbonate. See ammonium bicarbonate.

ammonium acid fluoride. See ammonium bifluoride.

ammonium acid methanearsonate.

CH₃AsO(OH)ONH₄. A postemergent herbicide, available as "Ansar" 157 [KMG-Bernuth], a clear solution containing 9.54% As.

ammonium acid phosphate. See ammonium phosphate, monobasic.

ammonium alginate. (ammonium polymanuronate). C₆H₇O₆•NH₄. A hydrophilic, colloid.

Properties: Filamentous, grainy, granular or powder, colorless or slightly yellow, may have a slight characteristic smell and taste. Slowly soluble in water forming a viscous solution. Insoluble in alcohol.

Grade: Technical, FCC.

Use: Thickening agent and stabilizer in food products.
See algin.

ammonium alum. See aluminum ammonium sulfate.

ammonium aluminum chloride. See aluminum ammonium chloride.

ammonium arsenate.

CAS: 7784-44-3. $(\text{NH}_4)_2\text{HAsO}_4$.

Properties: White crystals or powder efflorescing in air with loss of ammonia. D 1.99. Soluble in water; decomposes in hot water.

ammonium aurin tricarboxylate.

$\text{C}(\text{C}_6\text{H}_3\text{OHCOONH}_4)_2(\text{C}_6\text{H}_3(\text{O})\text{COONH}_4)$.

Forms colored lakes with aluminum, chromium, iron, and beryllium.

ammonium benzenesulfonate. (ammonium sulfonate). $\text{C}_6\text{H}_5\text{SO}_3\text{NH}_4$.

Properties: Mp 271°C (decomposes), d 1.34.

Grade: 35% solution in kerosene.

Hazard: Flammable.

ammonium benzoate. $\text{C}_6\text{H}_5\text{COONH}_4$.

Properties: White crystals or powder. Soluble in water, alcohol, and glycerol. Decomposes at 198°C, d 1.260, sublimes at 160°C.

Use: Medicine, latex preservative.

ammonium baborate. See ammonium borate.

ammonium bicarbonate. (ammonium acid carbonate; ammonium hydrogen carbonate).

CAS: 1066-33-7. NH_4HCO_3 .

Properties: White crystals. D 1.586, mp (decomposes at 36–60°C). Soluble in water; insoluble in alcohol. Noncombustible.

Derivation: By heating ammonium hydroxide with an excess of carbon dioxide and evaporation.

Impurities: Ammonium carbonate.

Grade: Technical, CP, FCC.

Hazard: Evolves irritating fumes on heating to 35°C.

Use: Production of ammonium salts, dyes; leavening agent for cookies, crackers, cream-puff doughs; fire-extinguishing compounds; pharmaceuticals; degreasing textiles; blowing agent for foam rubber; boiler scale removal; compost treatment.

ammonium bichromate. See ammonium dichromate.

ammonium bifluoride. (ammonium acid fluoride; ammonium hydrogen fluoride).

CAS: 1341-49-7. NH_4HF_2 .

Properties: White crystals. Deliquescent, d 1.211. Soluble in water and alcohol.

Derivation: Action of ammonium hydroxide on hydrofluoric acid with subsequent crystallization.

Hazard: Corrosive to skin.

Use: Ceramics, chemical reagent, etching glass (white acid), sterilizer for brewery, dairy, and other equipment; electroplating processing beryllium, laundry sour.

ammonium binoxalate. $(\text{NH}_4)\text{HC}_2\text{O}_4 \cdot \text{H}_2\text{O}$.

Properties: Colorless crystals. D 1.556, decomposes on heating. Soluble in water.

Derivation: Action of ammonium hydroxide on oxalic acid with subsequent crystallization.

Use: Analytical reagent, ink removal from fabrics.

ammonium biphosphate. See ammonium phosphate, monobasic.

ammonium bisulfate. (acid ammonium sulfate; ammonium hydrogen sulfate). NH_4HSO_4 .

Properties: Colorless, deliquescent powder. Mp 145°C; d 1.79. Soluble in water; insoluble in acetone and alcohol.

Use: Catalyst in organic synthesis, hair wave formulation.

ammonium bisulfide. See ammonium sulfide.

ammonium bitartrate. (acid ammonium tartrate). $(\text{NH}_4)\text{HC}_4\text{H}_4\text{O}_6$.

Properties: White crystals. D 1.636. Soluble in water, acids, and alkalies; insoluble in alcohol.

Derivation: By the action of ammonium hydroxide on tartaric acid.

Use: Baking powder.

ammonium boranecarboxylate.

CAS: 74861-59-9. $\text{CH}_2\text{BO}_2 \cdot \text{H}_4\text{N}$.

Hazard: Moderately toxic.

ammonium borate. (ammonium baborate).

$\text{NH}_4\text{HB}_4\text{O}_7 \cdot 3\text{H}_2\text{O}$.

Properties: Colorless crystals, efflorescent with loss of ammonia. Soluble in water. D 2.38–2.95. Noncombustible.

Derivation: Action of ammonium hydroxide on boric acid with subsequent crystallization.

Hazard: Evolves irritating fumes, especially when heated.

Use: Fireproofing compounds, electrical condensers, herbicide.

ammonium bromide. NH_4Br .

Properties: Colorless crystals or yellowish white powder, soluble in water and alcohol, somewhat hygroscopic. D 2.43, mp sublimes. Noncombustible.

Derivation: Action of hydrobromic acid on ammonium hydroxide with subsequent crystallization.

Grade: Technical, pure, CP, NF.

Use: Precipitating silver salts for photographic plates, medicine (for its bromide ion), analytical chemistry, process engraving, textile finishing, fire retardant, anticorrosive agents.

AMMONIUM CADMIUM BROMIDE

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ammonium cadmium bromide. See cadmium ammonium bromide.

ammonium cadmium chloride. $4\text{NH}_4\text{Cl}\cdot\text{CdCl}_2$.

Properties: Colorless, rhombic crystals. Mw 397.3, d 2.01. Soluble in water.

Hazard: A poison and confirmed carcinogen.

ammonium caprylate. (octanoic acid ammonium salt). $\text{C}_8\text{H}_{19}\text{NO}_2$.

Properties: Hygroscopic crystals. Decomposed at room temperature, mp approximately 75C. Hydrolyzes readily. Soluble in alcohol and glacial acetic acid; partly soluble in acetone; insoluble in benzene.

Use: Pesticide, photographic emulsions, chemical intermediate.

ammonium carbamate. $\text{NH}_4\text{CO}_2\text{NH}_2$.

Properties: White, rhombic, crystalline powder; very volatile; forms urea upon heating. Soluble in water and alcohol. Sublimes at 60C, decomposes in air to evolve ammonia.

Derivation: Interaction of dry ammonia gas and carbon dioxide from ammonia liquor with ammonia and ammonium carbonate.

Grade: Technical.

Hazard: Evolves irritating fumes when heated.

Use: Fertilizer.

ammonium carbazotate. See ammonium picrate.

ammonium carbonate. (crystal ammonia; ammonium sesquicarbonate; hartshorn).

CAS: 506-87-6. $(\text{NH}_4)\text{HCO}_3\cdot(\text{NH}_4)\text{CO}_2\text{NH}_2$. A mixture of ammonium acid carbonate and ammonium carbamate.

Properties: Colorless, crystalline plates or white powder; unstable in air, being converted into the bicarbonate. Strong odor of ammonia, sharp ammoniacal taste. Soluble in water, decomposes in hot water, yielding ammonia and carbon dioxide. Non-combustible.

Derivation: Ammonium salts are heated with calcium carbonate.

Method of purification: Sublimation.

Grade: Technical, lumps, cubes, powder, CP, NF, FCC.

Hazard: Evolves irritating fumes when heated.

Use: Ammonium salts, medicine (expectorant), baking powders, smelling-salts, fire-extinguishing compounds, pharmaceuticals, textiles (mordant), fermentation accelerator in wine manufacture, organic chemicals, ceramics, washing wool.

ammonium ceric nitrate. See ceric ammonium nitrate.

ammonium chlorate.

CAS: 10192-29-7. NH_4ClO_3 .

Properties: Colorless or white crystals, water soluble.

Derivation: Reaction of ammonium chloride with sodium chlorate in solution.

Hazard: Spontaneous chemical reaction with reducing agents. Powerful oxidizer. When contaminated with combustible materials, it can ignite. Shock sensitive; can detonate when exposed to heat or vibration, especially when contaminated.

Use: Explosives.

ammonium chloride. (sal ammoniac).

CAS: 12125-02-9. NH_4Cl .

Properties: White crystals; cool, saline taste; somewhat hygroscopic. Sublimes at 350C, d 1.54. Soluble in water, glycerol; slightly soluble in alcohol.

Derivation: (1) As a by-product of the ammonia-soda process, (2) reaction of ammonium sulfate and sodium chloride solutions.

Grade: Technical (lumps or granulated), CP, USP, FCC.

Hazard: Eye and upper respiratory tract irritant.

Use: Dry batteries, mordant (dyeing and printing), soldering flux, manufacturing of various ammonia compounds, fertilizer, pickling agent in zinc coating and tinning, electroplating, washing powders, melt-retarding snow treatment, production of urea-formaldehyde resins and adhesives, bakery products.

ammonium chloroosmate. See ammonium hexachloroosmate.

ammonium chloroplatinate. See ammonium hexachloroplatinate.

ammonium chloroplatinite. (platinous ammonium chloride; platinum ammonium chloride).

CAS: 16919-58-7. $(\text{NH}_4)_2\text{PtCl}_4$.

Properties: Dark ruby-red crystals. Decomposes 140–150C. Soluble in water; insoluble in alcohol.

Use: In photography.

ammonium chromate. (chromic acid, diammonium salt).

CAS: 7788-98-9. $(\text{NH}_4)_2\text{CrO}_4$.

Properties: Yellow crystals. D 1.866, mp (decomposes). Soluble in cold water; insoluble in alcohol.

Derivation: Addition of ammonium hydroxide to a solution of ammonium bichromate, recovery by crystallization.

Impurities: Dichromates.

Grade: Technical, CP.

Hazard: Toxic by inhalation, strong irritant. Confirmed carcinogen.

Use: Mordant in dyeing; photography (sensitizer for gelatin coatings); analytical reagent; catalyst; corrosion inhibitor.

ammonium chrome alum. See chromium ammonium sulfate.

79 AMMONIUM HEXACHLOROPLATINATE

ammonium chromium sulfate. See chromium ammonium sulfate.

ammonium citrate, dibasic.



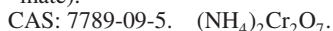
Properties: White granules, soluble in water, very slightly soluble in alcohol.

Use: Pharmaceuticals, rustproofing, cotton printing, plasticizer, analytical reagent in determination of phosphate in fertilizer.

ammonium cobaltous phosphate. See cobaltous ammonium phosphate.

ammonium decaborate. See ammonium pentaborate.

ammonium dichromate. (ammonium bichromate).



Properties: Orange needles. D 2.152 (25C), decomposes with slight heating. Soluble in water and alcohol.

Derivation: Action of chromic acid on ammonium hydroxide with subsequent crystallization.

Hazard: Dusts and solutions are toxic, irritating to eyes and skin; dangerous fire risk. Strong oxidizing agent may explode in contact with organic materials. TLV: 0.05 mg(Cr)/m³; Confirmed human carcinogen.

Use: Mordant for dyeing, pigments, manufacturing of alizarin, chrome alum, oil purification, pickling, manufacture of catalysts, leather tanning, synthetic perfumes, photography, process engraving and lithography (sensitizer for photo-chemical insolubilization of albumin, etc.), chromic oxide, pyrotechnics.

ammonium dihydrogen phosphate. See ammonium phosphate monobasic.

ammonium dimethyldithiocarbamate.



Properties: Yellow crystals. Soluble in water, decomposes in air.

Grade: 42% solution in water.

Use: Fungicide.

ammonium dinitro-*o*-cresolate.

Hazard: Dangerous in contact with combustible materials. Strong oxidizing agent. Flammable.

Use: Herbicide.

ammonium dithiocarbamate. $\text{CH}_6\text{N}_2\text{S}_2.$

Properties: Yellow crystals. Mp 99C (decomposes), d 1.45. Soluble in water.

Derivation: Reaction of ammonia with carbon disulfide.

Use: Organic synthesis, especially heterocyclic compounds; analytical reagent.

ammonium-ferric-cyano-ferrate(II). See ferric ammonium ferrocyanide.

ammonium fluoride.



Properties: White crystals. D 1.31, decomposed by heat. Soluble in cold water.

Derivation: Interaction of ammonium hydroxide and hydrofluoric acid with subsequent crystallization.

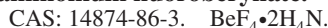
Method of purification: Recrystallization.

Grade: Technical, CP.

Hazard: Corrosive to tissue.

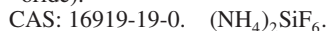
Use: Fluorides, analytical chemistry, antiseptic in brewing, etching glass, textile mordant, wood preservation, mothproofing.

ammonium fluoroberyllate.



Hazard: A poison by ingestion and inhalation.

ammonium fluosilicate. (ammonium silicofluoride).



Properties: White, crystalline powder. D 2.01. Soluble in alcohol and water.

Hazard: Strong irritant to eyes and skin.

Use: Laundry sours, mothproofing, disinfectant in brewing industry, glass etching, light metal casting, electroplating.

ammonium formate. $\text{HCOONH}_4.$

Properties: Deliquescent, crystalline powder. D 1.26; mp 115C. Soluble in water and alcohol.

Derivation: Reaction of formic acid with ammonia.

Use: Analytical chemistry (metal precipitant).

ammonium gluconate. $\text{NH}_4\text{C}_6\text{H}_{11}\text{O}_7.$

Properties: White powder. Soluble in water, insoluble in alcohol. Optical rotation +11.6 (in water).

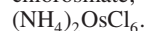
Derivation: From gluconic acid by neutralization with ammonia.

Use: Emulsifying agent for cheese and salad dressings.

ammonium glutamate. (monoammonium glutamate).

See sodium glutamate.

ammonium hexachloroosmate. (ammonium chlorosmate; osmium ammonium chloride).



Properties: Red powder. Contains 43.5% osmium. Soluble in alcohol and water.

Hazard: See osmium.

ammonium hexachloroplatinate. (ammonium chloroplatinate; platonic-ammonium chloride;

platonic sal ammoniac; platinum ammonium chloride). $(\text{NH}_4)_2\text{PtCl}_6.$

Properties: Orange-red crystals or yellow powder. D 3.06, mp (decomposes). Slightly soluble in water; insoluble in alcohol.

Grade: Technical, CP.

Use: Plating, platinum sponge.

AMMONIUM HEXAFLUOROGERMANATE 80

ammonium hexafluorogermanate. $(\text{NH}_4)_2\text{GeF}_6$.

Properties: White crystalline solid. D 2.564, mp 380C (sublimes). Soluble in cold water; insoluble in alcohol.

ammonium hexafluorosilicate. (cryptohalite; diammonium hexafluorosilicate; ammonium fluosilicate; ammonium silicofluoride; diazanium hexafluorosilicon(2-)).

CAS: 16919-19-0. $\text{F}_6\text{H}_8\text{N}_2\text{Si}$.

Properties: Odorless, crystalline powder.

Hazard: Very toxic; fatal.

Use: In pesticides.

ammonium hexanitratocerate. See ceric ammonium nitrate.

ammonium hydrate. See ammonium hydroxide.

ammonium hydrogen carbonate. See ammonium bicarbonate.

ammonium hydrogen fluoride. See ammonium bifluoride.

ammonium hydrogen sulfate. See ammonium bisulfate.

ammonium hydrosulfide. See ammonium sulfide.

ammonium hydroxide. (ammonia solution; aqua ammonia; ammonium hydrate). NH_4OH .

Properties: Colorless liquid, strong odor. Concentration of solutions range up to approximately 30% ammonia.

Grade: Technical, CP, 16%, 20%, 26%, NF (strong), FCC.

Hazard: Liquid and vapor extremely irritating, especially to eyes.

Use: Textiles, manufacture rayon, rubber, fertilizers, refrigeration, condensation polymerization, photography (development of latent images), pharmaceuticals, ammonia soaps, lubricants, fireproofing wood, ink manufacture, explosives, ceramics, ammonium compounds, saponifying fats and oils, organic synthesis, detergents, food additives, household cleanser.

ammonium hypophosphite. $\text{NH}_4\text{N}_2\text{PO}_2$.

Properties: Deliquescent crystals or white powder, decomposes when heated. Soluble in water and alcohol.

Hazard: Evolves flammable and toxic fumes on heating.

Use: Catalyst in nylon manufacture.

See phosphine.

ammonium ichthosulfonate. See ichthamol.

ammonium iodate. NH_4IO_3 .

Properties: White, odorless, granular powder.

Hazard: Fire risk in contact with organic materials.

Use: Oxidizing agent.

ammonium iodide. NH_4I .

Properties: White, hygroscopic crystals or powder.

D 2.56, mp sublimes with decomposition. Soluble in water or alcohol. Affected by light.

Use: Iodides, medicine (expectorant), photography.

ammonium laurate, anhydrous.

$\text{C}_{11}\text{H}_{23}\text{COONH}_4$.

Properties: Tan, waxlike material; free from ammonia odor. D 0.88 (25C), pH (5% dispersion) 7.6–7.8, mp 42–56C, neutralization value 120–125. Soluble in ethanol, methanol, cottonseed oil, mineral oil, (hot) in naphtha, toluene, and vegetable oil. Combustible.

Use: Production of oil-in-water emulsions with high oil content; cosmetics.

ammonium lignin sulfonate. See lignin sulfonate.

ammonium linoleate. $\text{C}_{17}\text{H}_{31}\text{COONH}_4$.

Properties: Yellow paste with ammoniacal odor. D 1.1, pH (5% dispersion) 9.5–9.8, total solids 82%. Soluble in water, ethanol and methanol; emulsifies in naphtha, toluene, mineral oil, and vegetable oil. Combustible.

Grade: Technical, 80%.

Use: Emulsifying agent for oils, waxes, and hydrocarbon solvents; surface tension reducer; detergent; water-repellent finishes.

ammonium magnesium arsenate. See magnesium ammonium arsenate dihydrate.

ammonium metavanadate. (ammonium vanadate). NH_4VO_3 .

Properties: White crystals. D 2.326, mp decomposes at 210C. Insoluble in saturated ammonium chloride solution; slightly soluble in cold water. Nonflammable.

Derivation: Alkali solutions of vanadium pentoxide and precipitation with ammonium chloride.

Use: For catalyst as vanadium pentoxide, dyes, varnishes, indelible inks, drier for paints and inks, photography, analytical reagent.

ammonium molybdate. (molybdic acid 85%). $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}\cdot 4\text{H}_2\text{O}$.

Properties: White, crystalline powder. D 2.27, mp decomposes. Soluble in water; insoluble in alcohol. Nonflammable.

Derivation: Dissolving molybdenum trioxide in aqueous ammonia.

Grade: Technical, CP, reagent (contains 85% MoO_3).

Hazard: Irritant.

Use: Analytical reagent, pigments, catalyst for dehydrogenation and desulfurization in petroleum and coal technology, production of molybdenum metal, source of molybdate ions.

ammonium-12-molybdophosphate.

(ammonium phosphomolybdate). $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3 \cdot 3\text{H}_2\text{O}$, or $(\text{NH}_4)_3\text{PMo}_{12}\text{O}_{40} \cdot x\text{H}_2\text{O}$.

Properties: Yellow, crystalline powder. Soluble in alkali; insoluble in alcohol and acids; very slightly soluble in water. Nonflammable.

Derivation: Interaction of ammonium molybdate with phosphoric and nitric acids.

Grade: 91% MoO_3 .

Use: Reagent, ion exchange columns, photographic additives, imparting water resistance.

ammonium-12-molybdosilicate. (ammonium silicomolybdate). $(\text{NH}_4)_4\text{SiMo}_{12}\text{O}_{40} \cdot x\text{H}_2\text{O}$.

Properties: Crystalline, yellow granules; thermally stable. Only slightly soluble in water, ethanol, and ethyl acetate. Nonflammable.

Grade: Technical, reagent.

Use: Catalysts, reagents, in atomic energy as precipitants and inorganic ion-exchangers, in photographic processes as fixing agents and oxidizing agents, in plating processes as additive, and in plastics, adhesives, and cement industries for imparting water resistance.

ammonium nickel chloride. See nickel ammonium chloride.

ammonium nickel sulfate. See nickel ammonium sulfate.

ammonium nitrate. (Norway saltpeter). NH_4NO_3 .

Properties: Colorless crystals. D 1.725, mp 169.6C, bp (decomposes at 210C with evolution of nitrous oxide). Soluble in water, alcohol, and alkalis.

Derivation: Action of ammonia vapor on nitric acid.

Grade: Usually expressed in percent of nitrogen, as 20.5% N, 33.5% N. FGAN is a fertilizer grade, prilled and usually coated with kieselguhr. Also available as an 83% solution. A temperature-stabilized grade is also available that inhibits breakdown of prills due to crystalline changes.

Hazard: May explode under confinement and high temperatures, but not readily detonated. Ventilate well. To fight fire, use large amounts of water. The material must be kept as cool as possible and removed from confinement and flooded with water in event of fire. Explodes more readily if contaminated with combustibles. Strong oxidizing agent. May be made resistant to flame and detonation by proprietary process involving addition of 5–10% ammonium phosphate.

Use: Fertilizer, explosives especially as prills/oil mixture, pyrotechnics, herbicides and insecticides,

manufacture of nitrous oxide, absorbent for nitrogen oxides, ingredient of freezing mixtures, oxidizer in solid rocket propellants, nutrient for antibiotics and yeast, catalyst.

See explosives.

ammonium nitrate-carbonate mixtures.

See calcium ammonium nitrate.

ammonium nitroso-β-phenylhydroxylamine.

See cupferron.

ammonium oleate. $\text{C}_{17}\text{H}_{33}\text{COONH}_4$.

An ammonium soap.

Properties: Yellow to brownish ointmentlike mass; ammonia odor. Decomposes on heating. Soluble in water and hot alcohol. Combustible.

Use: Emulsifying agent, cosmetics.

ammonium oxalate. $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$.

Properties: Colorless crystals. D 1.502, decomposed by heat. Soluble in water.

Use: Analytical chemistry, safety explosives, manufacture of oxalates, rust and scale removal.

ammonium palmitate. $\text{C}_{15}\text{H}_{31}\text{COONH}_4$. An ammonium soap.

Properties: Yellowish granules. Mp 20C. Soluble in water, hot alcohols, and benzene. Combustible.

Derivation: Reaction of palmitic acid and ammonium carbonate.

Use: Thickening agent for petroleum-derived solvents, lubricants, etc.; waterproofing.

ammonium paratungstate. See ammonium tungstate.

ammonium pentaborate. (ammonium decaborate). $(\text{NH}_4)_2\text{B}_{10}\text{O}_{16} \cdot 8\text{H}_2\text{O}$.

Properties: Crystals or powder. Soluble in water.

Use: Intermediate for boron chemicals; as a power-level control in atomic submarines.

ammonium pentadecafluorooctanoate. See ammonium perfluorooctanoate.

ammonium perchlorate. (AP; APC). NH_4ClO_4 .

Properties: White crystals. D 1.95, mp (decomposes on heating). Soluble in water.

Derivation: Interaction of ammonium hydroxide, hydrochloric acid, and sodium chlorate. Recovery by crystallization.

Hazard: Strong oxidizing agent; ignites violently with combustibles. Shock sensitive; may explode when exposed to heat or by spontaneous chemical reaction. Sensitive, high explosive when contaminated with reducing materials. Skin irritant.

Use: Explosives, pyrotechnics, analytical chemistry, etching and engraving agent, smokeless rocket and jet propellant.

AMMONIUM PERFLUOROOCCTANOATE 82

ammonium perfluorooctanoate. (ammonium pentadecafluorooctanoate).

CAS: 3825-26-1. $C_8F_{15}COONH_4$.

Properties: White powder. Mw 431, d 0.6–0.7 g/cc, bp 125C (sublimes). Highly soluble in water.

Hazard: Toxic by inhalation and skin contact. Liver damage. Possible carcinogen.

Use: For polymerization of fluorinated monomers.

ammonium permanganate. NH_4MnO_4 .

Properties: Crystal or powder form, having a metallic sheen in rich violet-brown or dark-purple shades, soluble in water.

Hazard: May explode on shock or on exposure to heat. Toxic by ingestion or by inhalation of dust or fume. Powerful oxidizer.

ammonium peroxychromate. $(NH_4)_3CrO_2$.

Properties: Red-brown crystals. Mp @ 40C (decomp), bp: explodes @ 50C, mw 234.1.

Hazard: A poison. Confirmed carcinogen. Moderately flammable by chemical reaction with reducing agents. A powerful oxidizer. Moderately explosive when heated.

ammonium perrhenate. NH_4ReO_4

Properties: Colorless, weakly oxidizing solid. Stable to heat; decomposes at 365C. Moderately soluble in hot water; slightly soluble in cold water.

Derivation: Liquid ion-exchange.

Hazard: Moderate fire risk in contact with reducers.

ammonium persulfate.

CAS: 7727-54-0. $(NH_4)_2S_2O_8$.

Properties: White crystals. D 1.98; mp decomposes. Strong oxidizer. Water soluble.

Derivation: Electrolysis of concentrated solution of ammonium sulfate. Recovered by crystallization.

Hazard: Fire risk in contact with reducers.

Use: Oxidizer, bleaching agent; photography; etchant for printed circuit boards, copper; electroplating; manufacture of other persulfates; deodorizing and bleaching oils; aniline dyes; preserving foods; depolarizer in batteries; washing infected yeast.

ammonium phosphate, dibasic. (ammonium phosphate, secondary; diammonium hydrogen phosphate; diammonium phosphate; DAP). $(NH_4)_2HPO_4$.

Properties: White crystals or powder. D 1.619, mildly alkaline in reaction. Soluble in water; insoluble in alcohol. Noncombustible.

Derivation: Interaction of ammonium hydroxide and phosphoric acid in proper proportions.

Grade: Technical, CP, fertilizer, feed, dentifrice, highly purified for phosphors, FCC.

Use: Flameproofing of wood, paper, and textiles; coating vegetation to retard forest fires; to prevent afterglow in matches and smoking of candle wicks; fertilizer (high analysis phosphate type); plant nutrient solutions; manufacture of yeast, vinegar, and

bread improvers; feed additive; flux for soldering tin, copper, brass, zinc; purifying sugar; in ammoniated dentifrices; halophosphate phosphors.

ammonium phosphate, hemibasic.

$NH_4H_2PO_4 \cdot H_3PO_4$.

Properties: White, crystalline material; somewhat hygroscopic. Strongly acid in reaction. Soluble in water. Noncombustible.

Use: Nutrient for truck gardens, yeast food, buffer for adjustment of pH values, metal cleaning.

ammonium phosphate, monobasic. (ammonium acid phosphate; ammonium biphosphate; ammonium dihydrogen phosphate; ammonium phosphate, primary). $NH_4H_2PO_4$.

Properties: Brilliant white crystals or powder. D 1.803. Mildly acid in reaction. Moderately soluble in water. Noncombustible.

Derivation: Interaction of phosphoric acid and ammonia in proper proportions.

Grade: Technical, CP, FCC, single crystals.

Use: Fertilizers; flameproofing agent; to prevent afterglow in matches; plant nutrient solutions; manufacturing of yeast, vinegar, yeast foods, and bread improvers; food additive; analytical chemistry.

ammonium phosphite. (neutral ammonium phosphite). $(NH_4)_2HPO_3 \cdot H_2O$.

Properties: Colorless, crystalline mass. Hygroscopic. Soluble in water.

Grade: Technical.

Use: Chemical (reducing agent), lubricating grease (corrosion inhibitor).

ammonium phosphomolybdate. See ammonium-12-molybdophosphate.

ammonium phosphotungstate. (ammonium phosphowolframate). $2(NH_4)_3PO_4 \cdot 24WO_3 \cdot xH_2O$.

Properties: White powder. Soluble in alkali, insoluble in acid, sparingly soluble in water.

Derivation: Interaction of ammonium tungstate, ammonium phosphate, and nitric acid.

Use: Chemical reagent, ion-exchange.

ammonium phosphowolframate. See ammonium phosphotungstate.

ammonium picrate. (ammonium carbazotate; ammonium picronitrate).

CAS: 131-74-8. $C_6H_2(NO_2)_3ONH_4$.

Properties: Yellow crystals. D 1.72, mp (decomposes). Slightly soluble in water and alcohol.

Hazard: A high explosive when dry, flammable when wet.

Use: Pyrotechnics, explosive compositions.

ammonium polymannuronate. See ammonium alginate.

ammonium polyphosphate. See urea-ammonium polyphosphate; Poly-N.

ammonium polysulfide. $(\text{NH}_4)_2\text{S}_x$.

Properties: Known only in solution. Yellow, unstable; H_2S odor. Decomposed by acids with evolution of hydrogen sulfide.

Derivation: Passing hydrogen sulfide into 28% ammonium hydroxide and dissolving an excess of sulfur in the resulting solution.

Hazard: Evolves toxic and flammable gas on contact with acids.

Use: Analytical reagent, insecticide spray.

ammonium potassium hydrogen phosphate.

Use: Food additive.

ammonium reineckate. See Reinecke salt.**ammonium ricinoleate.** $\text{C}_{17}\text{H}_{32}\text{OHCOONH}_4$.

Properties: White paste. Combustible.

Grade: Technical.

Use: Detergent, emulsifying agent.

ammonium saccharin.

CAS: 6381-61-9. $\text{C}_7\text{H}_5\text{N}_2\text{O}_3\text{S}$.

Properties: White crystals or crystalline powder; intense sweet taste. Sol in water.

Hazard: A severe eye irritant.

Use: Food additive.

ammonium salts. Salts formed by neutralization of ammonium hydroxide with acids. Usually white and water soluble; usually decomposed by heat into ammonia and the corresponding acid, which may also decompose. All ammonium salts liberate ammonia (NH_3) when heated with a strong base, e.g., sodium hydroxide or calcium hydroxide.

ammonium selenate. $(\text{NH}_4)_2\text{SeO}_4$.

Properties: Colorless crystals. D 2.194. Soluble in water, insoluble in alcohol.

Use: Mothproofing agent.

ammonium selenite. $(\text{NH}_4)_2\text{SeO}_3 \cdot \text{H}_2\text{O}$.

Properties: Colorless or slightly reddish crystals. Keep away from dust or light. Soluble in water.

Grade: Technical.

Use: Analysis (test for alkaloids), glass colorant.

ammonium sesquicarbonate. See ammonium carbonate.**ammonium silicofluoride.** See ammonium fluosilicate.**ammonium silicomolybdate.** See ammonium-12-molybdosilicate.

ammonium soap. A soap resulting from the reaction of a fatty acid with ammonium hydroxide. Has an appreciable vapor pressure of ammonia and decomposes on continued exposure, leaving the

fatty acid residue. Usually not sold as detergents, but used in toilet preparations and emulsions.

ammonium stearate. (octadecanoic acid; ammonium salt).

CAS: 1002-89-7. $\text{C}_{17}\text{H}_{35}\text{COONH}_4$.

Properties: Tan, waxlike solid; free from ammonia odor. Mw 301.58, d 0.89 (22C), pH (3% dispersion) 7.6, mp 73–75C, neutralization value 70–80. Soluble in boiling water and hot toluene; partly soluble in hot butyl acetate and ethanol. Combustible.

Grade: Available as anhydrous solid or as paste.

Hazard: A nuisance dust.

Use: Vanishing creams, brushless shaving creams, other cosmetic products; waterproofing of cements, concrete, stucco, paper and textiles, etc.

ammonium sulfamate.

CAS: 7773-06-0. $\text{NH}_4\text{OSO}_2\text{NH}_2$.

Properties: White, hygroscopic solid. Mp 130C, decomposes at 160C. Soluble in water and ammonia solution. Nonflammable.

Derivation: Hydrolysis of the product obtained when urea is treated with fuming sulfuric acid.

Hazard: Hot acid solutions when enclosed may explode.

Use: Flameproofing agent for textiles and certain grades of paper, weed and brush killer, electroplating, generation of nitrous oxide.

ammonium sulfate.

CAS: 7783-20-2. $(\text{NH}_4)_2\text{SO}_4$.

Properties: Brownish-gray to white crystals according to degree of purity. D 1.77, mp 513C with decomposition. Soluble in water, insoluble in alcohol and acetone. Nonflammable.

Derivation: (1) Ammoniacal vapors from destructive distillation of coal react with sulfuric acid, followed by crystallization and drying. (2) Synthetic ammonia is neutralized with sulfuric acid. (3) By-product of manufacture of caprolactam. (4) From gypsum by reaction with ammonia and carbon dioxide.

Method of purification: Recrystallization or sublimation.

Grade: Commercial, technical, CP, enzyme (no heavy metals), FCC.

Use: Fertilizers, water treatment, fermentation, fireproofing compositions, viscose rayon, tanning, food additive.

ammonium sulfate nitrate.

Properties: A double salt of approximately 60% ammonium sulfate and 40% ammonium nitrate, 26% nitrogen content. White to light gray granules, soluble in water.

Hazard: Oxidizer, dangerous in contact with organic materials.

ammonium sulfide.

CAS: 12124-99-1. $(\text{NH}_4)_2\text{S}$. The true sulfide is stable only in the absence of moisture and below

AMMONIUM SULFITE

84

0C. The ammonium sulfide of commerce is largely ammonium bisulfide or hydrosulfide, NH_4HS .

Properties: Yellow crystals. Mp (decomposes). Soluble in water, alcohol, and alkalis. Evolves hydrogen sulfide on contact with acids.

Grade: Technical, CP, liquid, 40–44%.

Hazard: Strong irritant to skin and mucous membranes.

Use: Textile industry, photography (developers), coloring brasses, bronzes, iron control in soda ash production, synthetic flavors.

ammonium sulfite.

CAS: 10192-30-0. $(\text{NH}_4)_2\text{SO}_3 \cdot \text{H}_2\text{O}$.

Properties: Colorless crystals; acrid, sulfurous taste. D 1.41. Hygroscopic, sublimes at 150C with decomposition. Soluble in water.

Use: Chemical (intermediates, reducing agent), medicine, permanent wave solutions, photography, metal lubricants.

ammonium sulfocyanate. See ammonium thiocyanate.

ammonium sulfocyanide. See ammonium thiocyanate.

ammonium sulfonate. See ammonium benzenesulfonate.

ammonium sulforicinoleate.

Properties: Yellow liquid. Soluble in alcohol. Combustible.

Grade: Technical.

Use: Medicine, furniture polish.

ammonium tartrate.

CAS: 3164-29-2. $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6$.

Properties: White crystals. D 1.601, decomposes on heating. Soluble in water and alcohol.

Use: Textile industry, medicine.

ammonium tetrathiocyanodiammonochromate. See Reinecke salt.

ammonium tetrathiotungstate. $(\text{NH}_4)_2\text{WS}_4$.

Properties: Orange-colored, crystalline powder; sensitive to heat; hydrogen sulfide odor. Mp (decomposes). Soluble in water, ammoniacal, and amine solutions.

Use: Source of high purity tungsten disulfide for catalysts, lubricants, semiconductors.

ammonium thiocyanate. (ammonium sulfocyanide; ammonium sulfocyanate).

CAS: 1762-95-4. NH_4SCN .

Properties: Colorless, deliquescent crystals. D 1.3057; mp 149.6C; decomposes at 170C. Soluble in water, alcohol, acetone, and ammonia.

Derivation: By boiling an aqueous solution of ammonium cyanide with sulfur or polysulfides, or by the reaction of ammonia and carbon disulfide.

Grade: Technical, CP, 50–60% solution.

Use: Analytical chemistry; chemicals (thiourea); fertilizers; photography; ingredients of freezing solutions, especially liquid rocket propellants; fabric dyeing; zinc coating; weed killer and defoliant; adhesives; curing resins; pickling iron and steel; electroplating; temporary soil sterilizer; polymerization catalyst; separator of zirconium and hafnium, and of gold and iron.

ammonium thioglycolate. $\text{HSCH}_2\text{COONH}_4$.

Properties: Colorless liquid, repulsive odor. Evolves hydrogen sulfide. Combustible.

Use: Solutions of various strengths are used for hair waving and for hair removal.

ammonium thiosulfate.

CAS: 7783-18-8. $(\text{NH}_4)_2\text{S}_2\text{O}_3$.

Properties: White crystals decomposed by heat. PH of 60% solution 6.5–7.0. Very soluble in water.

Grade: Pure crystals (97%), 60% photographic solution.

Use: Photographic fixing agent, especially for rapid development; analytical reagent; fungicide; reducing agent; brightener in silver plating baths; cleaning compounds for zinc-base die-cast metals; hair waving preparations; fog screens.

ammonium titanium oxalate. (titanium ammonium oxalate). $(\text{NH}_3)_2\text{TiO}(\text{C}_2\text{O}_4)_2$.

Properties: A water-soluble powder.

USE: Mordant in dyeing cellulosic fibers, leather, etc.

ammonium tungstate. (ammonium

wolframate; ammonium paratungstate). $(\text{NH}_4)_6\text{W}_7\text{O}_{24} \cdot 6\text{H}_2\text{O}$.

Properties: White crystals. Soluble in water; insoluble in alcohol.

Derivation: Interaction of ammonium hydroxide and tungstic acid with subsequent crystallization.

Use: Preparation of ammonium phosphotungstate and tungsten alloys.

See ammonium metatungstate.

ammonium valerate. (pentanoic acid, ammonium salt; valeric acid, ammonium salt). $\text{C}_5\text{H}_{13}\text{NO}_2$.

Properties: Very hygroscopic crystals. Mp 108C, mw 119.16. Very soluble in water, alcohol, and ether.

Grade: Food and flavor codex.

Use: Flavoring material.

ammonium vanadate. See ammonium metavanadate.

ammonium wolframate. See ammonium tungstate.

ammonium zirconifluoride. See zirconium ammonium fluoride.

ammonium zirconyl carbonate.

(NH₄)₃ZrOH(CO₃)₃•2H₂O. D 1.238 (24C). Stable up to approximately 68C; decomposes in dilute acids, alkalies.

Grade: Aqueous solution.

Use: Ingredient in water repellents for paper and textiles, catalyst, stabilizer in latex emulsion paints, ingredient in floor wax to aid in resistance to detergents, lubricant in fabrication of glass fibers.

ammonobasic mercuric chloride. See mercury, ammoniated.

ammonolysis. The procedure that is analogous to hydrolysis, with ammonia substituted for water.

ammonotelic. Organisms that excrete excess nitrogen in the form of ammonia.

Ammo-Phos. A high-analysis ammonium phosphate-containing fertilizers.

amniote egg. The type of egg laid by reptiles and birds, having a nutritious yolk and a hard outer shell to protect the embryo from the dry environment. The amniote egg is named for the amnion, a sac that contains the embryo.

amobarbital. (5-ethyl-5-isoamylbarbituric acid). C₁₁N₁₈N₂O₃.

Properties: White, crystalline powder; odorless with bitter taste. Mp 156–161C. Solutions are acid to litmus. Very slightly soluble in water; soluble in alcohol.

Grade: USP.

Hazard: May be a habit forming drug of abuse.

Use: Medicine (also as sodium salt), hypnotic.

Amoco Performance Products. Specialty engineered polymers to help reduce pollution.

amodiaquine hydrochloride.

C₂₀H₂₂ON₃Cl•2HCl•2H₂O.

Properties: Yellow crystalline solid; odorless; bitter. Mp 150–160C (decomposes), pH (1% solution) 4.0–4.8. Soluble in water; sparingly soluble in alcohol; very slightly soluble in benzene, chloroform, and ether.

Grade: NF.

Use: Medicine (antimalarial).

amorphous. Noncrystalline, having no molecular lattice structure which is characteristic of the solid state. All liquids are amorphous. Some materials that are apparently solid, such as glasses, or semisolid, such as some high polymers, rubber, and sulfur allotropes, also lack a definite crystal structure and a well-defined melting point. They are considered high-viscosity liquids. The cellulose molecule contains amorphous as well as crystalline areas. Carbon derived by thermal

decomposition or partial combustion of coal, petroleum, and wood is amorphous (coke, carbon black, charcoal), though other forms (diamond, graphite) are crystalline. Amorphous metallic alloys for transformer coils are made by extremely rapid cooling of the molten mixture. They are composed of iron, nickel, phosphorus, and boron.

See liquid; liquid crystal; glass, metallic.

amorphous phosphorus. (red phosphorus).

CAS: 7723-14-0. P.

Properties: Nontoxic, less flammable, dark red mass or powder.

Derivation: Produced by heating ordinary phosphorus to 260C in the absence of oxygen.

amorphous wax. See microcrystalline wax.

amosite. A type of asbestos.

See asbestos.

AMP. (1) Abbreviation for 2-amino-2-methyl-1-propanol. (2) Abbreviation for adenosine monophosphate.

See adenylic acid.

AMP resistance. See antibiotic resistance.

A5MP. Abbreviation for adenosine-5-monophosphoric acid.

See 5'-adenylic acid.

“AMP-95” [Dow]. TM for 2-amino-methyl-1-propanol.

Grade: 95% and 99+%.

Available forms: Liquid.

Use: Multifunctional amine, used as codispersant, solubilizer, stabilizer, neutralizer, buffer, and catalyst.

Ampco. A series of aluminum-iron-copper alloys containing 6–15% aluminum, 1.5–5.25% iron, balance copper. Resistant to fatigue, corrosion, erosion, wear, and cavitation pitting.

Use: For bushings, bearings, gears, slides, etc.

Ampcoloy. A series of industrial copper alloys including low-iron-aluminum bronzes, nickel-aluminum bronzes, tin bronzes, manganese bronzes, lead bronzes, beryllium-copper, and high-conductivity alloys.

Ampco-Trode. A series of aluminum-bronze arc-welding electrodes and filler rod containing 9.0–15.0% aluminum, 1.0–5.0% iron, balance copper, for joining like or dissimilar metals and overlaid surfaces resistant to wear, corrosion, erosion, and cavitation-pitting.

AMPD. Abbreviation for 2-amino-2-methyl-1,3-propanediol.

AMPHETAMINE

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amphetamine. (1-phenyl-2-aminopropane; methylphenethylamine; Benzedrine). $C_6H_5CH_2CH(NH_2)CH_3$.

Properties: Colorless, volatile liquid; characteristic strong odor; slight burning taste. Bp 200–203C (decomposes), flash p 80F (26.6C). Soluble in alcohol and ether; slightly soluble in water.

Grade: Dextro-, dextrolevo-. Also available as phosphate and sulfate.

Hazard: Flammable, moderate fire risk. Basis of a group of hallucinogenic (habit-forming) drugs that affect the central nervous system. Sale and use restricted to physicians. Production limited by law.

Use: Medicine.

amphibole. A type of asbestos.

See asbestos.

amphibolic pathway. A metabolic pathway used in both catabolism and anabolism.

amphipathic. Containing both polar and nonpolar domains.

amphipathy. The simultaneous attraction and repulsion in a single molecule or ion consisting of one or more groups having an affinity for the phase in which they are dissolved together with groups that tend to be expelled by the medium.

amphiphilic. Molecule having a water-soluble polar head (hydrophilic) and a water-insoluble organic tail (hydrophobic), e.g., octyl alcohol, sodium stearate. Such molecules are necessary for emulsion formation and for controlling the structure of liquid crystals.

See emulsion; liquid crystal.

amphiprotic. Capable of donating and accepting protons, thus able to serve as an acid or a base.

ampholyte. A substance that can ionize to form either anions or cations and thus may act as either an acid or a base. An ampholytic detergent is cationic in acid media and anionic in base media. Water is an ampholyte.

See amphoteric.

amphora catalyst. See catalyst, amphora.

“Amphosol” [*Stepan*]. (cocamidopropyl betaine). TM for chemical used in shampoos, liquid hand soap, bubble bath, thickeners, and foam enhancers.

amphoteric. Having the capacity of behaving either as an acid or a base. Thus, aluminum hydroxide neutralizes acids with the formation of aluminum salts, $Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$, and also dissolves in strongly basic solutions to form aluminates, $Al(OH)_3 + 3NaOH \rightarrow Na_3AlO_3 + 3H_2O$. Amino acids and proteins are amphoteric,

i.e., their molecules contain both an acid group (COOH) and a basic group (NH₂). Thus, wool can absorb both acidic and basic dyes.

amphoteric dye. A dye that contains both acidic and basic chromophores.

amphotericin B. A polyene antifungal antibiotic. $C_{47}H_{73}NO_{17}$.

Properties: Pale yellow, semicrystalline powder. Mp >170C (gradual decomposition). Insoluble in water; slightly soluble in methanol; somewhat more soluble in dimethylsulfoxide.

Derivation: Fermentation with *Streptomyces nodosus*. Commercially available as a deoxycholate complex.

Grade: USP.

Hazard: May have undesirable side effects.

Use: Medicine (meningitis treatment).

amphoteric ion-exchange resin. Any ion-exchange resin that contains both positive and negative groups. Such resins are most useful in ion retardation where all ionic materials can be removed from solution.

amphoteric oxide. An oxide that shows some acidic and some basic properties insofar as it can accept or donate protons.

ampicillin (USAN). (6,D,α-aminophenylacetamido penicillanic acid). $C_{16}H_{19}N_3O_4S$. A semisynthetic antibiotic, active against some Gram-negative infections.

amplification. An increase in the number of copies of a specific DNA fragment; can be in vivo or in vitro.

See cloning; polymerase chain reaction.

amprolium. (1-[(4-amino-2-propyl-5-pyrimidinyl)-methyl]-2-picolinium chloride). $C_{14}H_{19}ClN_4$. A coccidiostat used in veterinary medicine.

amprotropine phosphate. (phosphate of the *dl*-tropic acirdiethylamino-2,2-dimethyl-*l*-propanol). $C_{18}H_{29}NO_3 \cdot H_3PO_4$.

Properties: Bitter crystals. Mp 142–144C. Soluble in water; slightly soluble in alcohol.

Use: Medicine (antispasmodic).

AMPS (sulfonic acid). See 2-acrylamido-2-methyl-1-propanesulfonic acid.

ampule. (ampul; ampulla). A small-sealed glass container used for sterile liquids. It protects contents from air or contamination.

amsonic acid. (4,4'-diamino-2,2'-stilbene-disulfonic acid). $C_{14}H_{14}N_2O_6S_2$.

Properties: Acicular crystals. Slightly soluble in water.

Use: Manufacture of bleaching agents and organic dyes.

amsulosin hydrochloride. See *r*-(-)-5-(2-((2-(2-ethoxyphenoxy)ethyl)amino)propyl)-2-methylbenzene-sulfanamide hydrochloride.

amygdalic acid. See mandelic acid.

amygdalin. (mandelonitrile- β -gentiobioside; amygdaloside). $C_6H_5CHCNO_2C_{12}H_{21}O_{10}$. A glycoside found in bitter almonds, peaches, and apricots.

Properties: White crystals; bitter taste. Mp 214–216C (anhydrous). Soluble in water and alcohol; insoluble in ether.

See almond oil (note).

amyl. The 5-carbon aliphatic group C_5H_{11} , also known as pentyl. Eight isomeric arrangements (exclusive of optical isomers) are possible. The amyl compounds occur (as in fusel oil) or are formed (as from the petroleum pentanes) as mixtures of several isomers, and, since their boiling points are close and their other properties similar, it is neither easy nor usually necessary to purify them. See amyl alcohol.

amyl acetate. (amylacetic ester; banana oil; pear oil).

CAS: 628-63-7. $CH_3COOC_5H_{11}$. Commercial amyl acetate is a mixture of isomers, the composition and properties depending upon the grade and derivation. The main isomers are isoamyl, normal, and secondary amyl acetates.

Properties: Colorless liquid; persistent banana-like odor. Flash p 65–95F (18.3–35C) (CC) depending on grade, autoign temp approximately 714F (380C).

Derivation: Esterification of amyl alcohol (often fusel oil) with acetic acid and a small amount of sulfuric acid as catalyst.

Method of purification: Rectification.

Grade: Commercial (85–88%), high test (85–88%), technical (90–95%), pure (95–99%), special antibiotic grade. Amyl acetate is also sold by original source as from fusel oil, pentane, or Oxo process.

Hazard: Flammable, high fire risk. Explosive limits in air 1.1–7.5%.

Use: Solvent for lacquers and paints, extraction of penicillin, photographic film, leather polishes, nail polish, warning odor, flavoring agent, printing and finishing fabrics, solvent for phosphors in fluorescent lamps.

***n*-amyl acetate.**

CAS: 628-63-7. $CH_3COOCH_2CH_2CH_2CH_2CH_3$.

Properties: Colorless liquid. Bp 148.4C, mp –70.8C, d 0.879 (20/20C), wt/gal (20C) 7.22 lb, flash p 77F (25C) (CC). Very slightly soluble in water; miscible with alcohol and ether. Vapor heavier than air. Autoign temperature 714F (380C).

Derivation: Esterification of *n*-amyl alcohol with acetic acid.

Hazard: Flammable, dangerous fire risk.

Use: See amyl acetate.

***sec*-amyl acetate.**

CAS: 626-38-0. $CH_3CO_2C_5H_{11}$.

Properties: Colorless liquid. May be mixture of secondary isomers. Distillation range 123–145C, mild odor, nonresidual, purity of ester content as amyl acetate 85–88%, d 0.862–0.866 (20/20C), flash p 89F (31.6C) (CC), wt/gal (20C) approximately 7.19 lbs.

Derivation: Esterification of *sec*-amyl alcohol and acetic acid.

Grade: Technical.

Hazard: Flammable, moderate fire risk. Toxic. Upper respiratory tract irritant.

Use: Solvent for nitrocellulose and ethyl cellulose, cements, coated paper, lacquers, leather finishes, nail enamels, plastic wood, textile sizing, and printing compounds.

amylacetic ester. See amyl acetate.

amyl acid phosphate. $(C_5H_{11})_2HPO_4$ and $C_5H_{11}H_2PO_4$. A mixture of primary and amyl isomers. Water-white liquid, d 1.070–1.090, flash p 245F (118.3C) (COC). Insoluble in water, soluble in alcohol. Combustible.

Hazard: Strong irritant to tissue.

Use: Curing catalyst and accelerator in resins and coatings, stabilizer, dispersion agent, lubricating and antistatic agent in synthetic fibers.

amyl alcohol. (amyl hydrate). Eight isomers of amyl alcohol, $C_5H_{11}OH$, are possible, exclusive of several optical isomers, and six are offered commercially. In addition, definite mixtures of the isomers are sold under a variety of names (unfortunately, some of them identical with the names of the pure isomers) as well descriptive data on the pure isomers, see (1) *n*-amyl alcohol, primary; (2) 2-methyl-1-butanol (active amyl alcohol from fusel oil); (3) isoamyl alcohol, primary; (4) 2-pentanol; (5) 3-pentanol; (6) *tert*-amyl alcohol. The other two isomers not described in detail are (7) *sec*-isoamyl alcohol; (8) 2,2-dimethyl-1-propanol. (1), (2), (3), and (8) are primary alcohols; (4), (5), and (7) are secondary alcohols; and (6) is a tertiary alcohol. (1), (4), and (5) are normal, and (2), (3), (6), (7), and (8) are branched-chain compounds. (2), (4), and (7) are asymmetric and have optically active forms.

***n*-*sec*-amyl alcohol.** See 2- and 3-pentanol.

***tert*-amyl alcohol.** (dimethylethylcarbinol; 2-methyl-2-butanol; amylene hydrate; *tert*-pentanol). CAS: 75-85-4. $(CH_3)_2C(OH)CH_2CH_3$.

Properties: Colorless liquid; camphor odor; burning taste. D 0.81 (20/20C), fp –11.9C, bp 101.8C, refr

sec-AMYL ALCOHOL, ACTIVE

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index 1.4052 (20C), wt/gal 6.76 lb, flash p 70F (21.2C) (OC), Autoign temp 819F (437C). Slightly soluble in water; miscible with alcohol and ether. Solutions neutral to litmus.

Derivation: Fractional distillation of the mixed alcohols resulting from the chlorination and alkaline hydrolysis of pentanes.

Grade: Technical, CP, NF.

Hazard: Flammable, dangerous fire risk.

Use: Solvent, flotation agent, organic synthesis, medicine (sedative).

sec-amyl alcohol, active. See 2-pentanol.

amyl alcohol, fermentation. See fusel oil.

amyl alcohol, primary. A mixture of primary amyl alcohols made from normal butenes by the Oxo process is sold under this name. It consists of 60% primary *n*-amyl alcohol, 35% 2-methyl-1-butanol, and 5% 3-methyl-1-butanol.

Hazard: Flammable, moderate fire risk.

Use: A solvent.

***n*-amyl alcohol, primary.** (1-pentanol; *n*-butyl carbinol).

CAS: 71-41-0. $\text{CH}_3(\text{CH}_2)_4\text{OH}$.

Properties: Colorless liquid; mild odor. Bp 137.8C, fp -78.9C , d 0.812–0.819 (20/20C), wt/gal (20C) 6.9 lb, flash p 123F (50.5C) (OC). Autoign temp 572F (300C). Slightly soluble in water; miscible with alcohol, benzene, and ether. Combustible.

Derivation: Fractional distillation of the mixed alcohols resulting from the chlorination and alkaline hydrolysis of pentane.

Grade: Technical, CP, 98%.

Hazard: Lower explosive level in air 1.2% by volume. Moderate fire risk.

Use: Raw material for pharmaceutical preparations; organic synthesis solvent.

amyl alcohol, primary active. See 2-methyl-1-butanol.

amyl aldehyde. See *n*-valeraldehyde.

***n*-amylamine.** (pentylamine; 1-aminopentane). $\text{C}_5\text{H}_{11}\text{NH}_2$.

Properties: Colorless liquid, d 0.75 (20/20C), fp -55.0C , bp 104.4C, flash p 45F (7.2C) (OC). Soluble in water, alcohol, and ether.

Derivation: Reaction of ammonia and amyl chloride which gives a mixture of mono-, di-, and triamyl amines.

Grade: Technical.

Hazard: Flammable, dangerous fire risk. Strong irritant.

Use: Chemical intermediate, dyestuffs, rubber chemicals, insecticides, synthetic detergents, flotation agents, corrosion inhibitors, solvent, gasoline additive, pharmaceuticals.

sec-amylamine. (2-aminopentane).

$\text{CH}_3(\text{CH}_2)_2\text{CH}(\text{CH}_3)\text{NH}_2$.

Properties: Colorless liquid. Bp 198F, d 0.7; flash p 20F (65.5C).

Hazard: Flammable, dangerous fire risk.

Use: See *n*-amylamine.

amylase. A class of enzymes which convert starch into sugars. Fungal and bacterial amylases from specific fungi and bacteria have been suggested for commercial fermentation processes.

Use: Textile desizing, conversion of starch to glucose sugar in syrups (especially corn syrups), baking (to improve crumb softness and shelf life), dry cleaning (to attack food spots and similar stains).

See amylopsin; diastase; ptyalin.

***n*-amylbenzene.** (1-phenylpentane).

$\text{C}_6\text{H}_5\text{CH}_2(\text{CH}_2)_3\text{CH}_3$. Water-white liquid, mild odor, fp -75C , bp 205C, d 0.8585 (20/4C), flash p 150F (65.5C) (OC). Insoluble in water, soluble in hydrocarbons and coal tar solvents. Combustible.

Hazard: Irritant to skin and eyes, narcotic in high concentrations. Moderate fire risk.

sec-amylbenzene. (2-phenylpentane).

$\text{CH}_3\text{CH}(\text{C}_6\text{H}_5)\text{CH}_2\text{CH}_2\text{CH}_3$.

Properties: Clear liquid. Fp -75C , bp 190.3C, d 0.861 (20/4C).

Hazard: Moderate fire hazard. Combustible. Irritant to skin and eyes, narcotic in high concentrations.

Grade: Pure, 99.0 mole %, technical, 95.0 mole %.

Use: Weed control, chemical intermediate.

amyl benzoate. See isoamyl benzoate.

amyl butyrate. See isoamyl butyrate.

amyl carbinol. See hexyl alcohol.

***n*-amyl chloride.** (1-chloropentane).

CAS: 543-59-9. $\text{CH}_3(\text{CH}_2)_3\text{CH}_2\text{Cl}$.

Properties: Colorless liquid. Bp 107.8C, fp -99C , d 0.883 (20/4C), refr index 1.4128 (20C), flash p 54F (12.2C) (OC). Miscible with alcohol and ether; insoluble in water. Autoign temp 500F (260C).

Derivation: (1) Distillation of amyl alcohol with salt and sulfuric acid, (2) addition of hydrochloric acid to α -amylene.

Grade: Technical.

Hazard: Flammable, dangerous fire risk; lower explosive level 1.4%, upper explosive level 8.6%. May be narcotic in high concentrations.

Use: Chemical intermediate.

amyl chlorides, mixed.

Properties: Straw- to purple-colored liquid. D 0.88 (20C), 95% distills between 85 and 109C, wt/gal 7.33 lb, refr index (20C) 1.406. Insoluble in water; water azeotrope at 77–82C approximately 90% $\text{C}_5\text{H}_{11}\text{Cl}$, miscible with alcohol and ether. Flash p 38F (3.3C) (OC). Components:

1-chloropentane, bp 107.8C; 2-chloropentane, bp 96.7C; 3-chloropentane, bp 97.3C; 1-chloro-2-methylbutane, bp 99.9C; 1-chloro-3-methylbutane, bp 98.8C; 3-chloro-2-methylbutane, bp 93.0C; 2-chloro-2-methylbutane, bp 86.0C.

Derivation: Vapor phase chlorination of mixed normal pentane and isopentane.

Hazard: Flammable, dangerous fire risk. Explosive limits in air 1.4–8.6%. May be narcotic in high concentrations.

Use: Synthesis of other amyl compounds, solvent, rotogravure ink vehicles, soil fumigation.

α -amylcinnamic alcohol. (2-benzylidene-1-heptanol). $C_6H_5CH:C(CH_2OH)C_5H_{11}$.

Properties: Yellow liquid; floral odor. D 0.954–0.962 (25/25C). Soluble in 3 parts 70% alcohol. Combustible.

Derivation: Synthetic.

Use: Perfumery, flavoring.

α -amylcinnamic aldehyde. (jasmine aldehyde; α -pentylcinnamaldehyde). $C_6H_5CH:C(CHO)C_5H_{11}$.

Properties: Clear, yellow, oily liquid; jasmine-like odor. D 0.962–0.968, refr index 1.554–1.559. Aldehyde content 97%. Soluble in 6 volumes of 80% alcohol. Combustible.

Derivation: Synthetic.

Grade: Technical, FCC.

Use: Perfumery, flavoring.

6,*n*-amyl-*m*-cresol. $C_{12}H_{18}O$.

Properties: Liquid at room temperature. Mp 24C. Insoluble in water; soluble in acetone and ethanol.

Use: Prevention of molds, bactericide.

α ,*n*-amylene. Legal label name for 1-pentene.

β ,*n*-amylene. Legal label name for 2-pentene.

amylene dichloride. See dichloropentane.

amylene hydrate. See *tert*-amyl alcohol.

***n*-amyl ether.** (diamyl ether). $C_{10}H_{22}O$.

Properties: Colorless liquid. Bp 186C, fp –70C, d 0.783, flash p 135F (57C), autoign temp 340F (171C), refr index 1.41. Insoluble in water; soluble in alcohol and ether.

Hazard: Narcotic in high concentration.

Use: General solvent for fats, oils, waxes, resins, etc.

amyl formate. $HCOOC_5H_{11}$.

Properties: Colorless liquid composed of a mixture of isomeric amyl formates with isoamyl formate in predominance. Plum-like odor. Less odoriferous and more active solvent than amyl acetate. It also has both a lower boiling point and a higher rate of evaporation. D 0.880–0.885, bp 123.5C, flash p 80F (26.6C). Miscible with oils, hydrocarbons, alcohols, ketones; slightly soluble in water.

Grade: Technical, FCC.

Hazard: Flammable, dangerous fire risk. Toxic by ingestion and inhalation.

Use: Solvent for cellulose esters, resins; solvent mixtures; films and coatings; perfume for leather; flavoring.

***n*-amylfuroate.** (amyl pyromucate).

$C_4H_5OCO_2C_5H_{11}$.

Properties: Colorless oil. Decomposes on standing, d 1.0335 (20/4C), bp 233C. Insoluble in water; soluble in alcohol. Combustible.

Derivation: Esterification of furoic acid.

Use: Perfumes, lacquers.

amyl heptanoate. $C_{12}H_{24}O_2$.

Properties: Colorless to pale-yellow liquid; fruity taste. D: 0.859, refr index: 1.422.

Use: Food additive.

amyl hydrate. See amyl alcohol.

amyl hydride. See *n*-pentane.

amyl mercaptan. Legal label name for pentanethiol.

***tert*-amyl mercaptan.** See 2-methyl-2-butanethiol.

6-amylmercaptapurine. See 6-(pentylthio)purine.

amyl methyl alcohol.

CAS: 105-30-6. $C_6H_{14}O$.

Properties: Liquid. Bp: 130C, flash p: 114F (CC), d: 0.804, vap d: 3.52.

Hazard: Moderately toxic by ingestion and skin contact. A skin and severe eye irritant. Human systemic irritant by inhalation. A flammable liquid; can react with oxidizing materials. To fight fire, use CO_2 , dry chemical.

amyl nitrate (mixed isomers). $C_5H_{11}NO_3$.

Properties: Colorless liquid; ethereal odor. Bp 145C, flash p 118F (47.8C), d 0.99 (20C). Flammable.

Hazard: Oxidizing agent, moderate fire risk.

Use: Additive to increase cetane number of diesel fuels.

amyl nitrite. (isoamyl nitrite).

(CAS: 463-04-7. $CH_3)_2CHCH_2CH_2NO_2$.

Properties: Yellowish liquid; peculiar ethereal, fruity odor; pungent aromatic taste. D 0.865–0.875 (25C); bp 96–99C; autoign temp 405F (207C). Soluble in alcohol; almost insoluble in water. Decomposes on exposure to air, light, or water.

Derivation: Interaction of amyl alcohol with nitrous acid.

Grade: NF, (75% min), technical.

Hazard: Flammable, dangerous fire risk, a strong oxidizer. Vapor may explode if ignited.

Use: Perfumes, diazonium compounds.

AMYLOGUCOSIDASE

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amyloglucosidase. An enzyme used commercially to convert starches to dextrose.

amylograph. A device designed to record the action of heat on a mixture of flour and water. It is used in measuring diastatic activity through viscosity change.

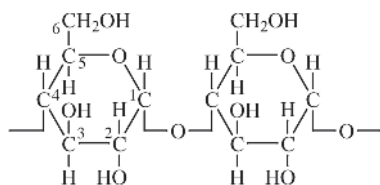
amyloid. A gelatinous hydrate that results from diluting a solution of concentrated sulfuric acid and cellulose with water.

amyopectin. The outer, almost insoluble portion of starch granules. It is a hexosan, a polymer of glucose, and is a branched molecule of many glucose units. It stains violet with iodine and forms a paste with water.

amylopsin. (animal diastase). The starch-digesting enzyme of pancreatic juice, the most powerful enzyme of the digestive tract. It is an amylase that converts starches through the soluble-starch stage to various dextrans and maltose. It acts in neutral, slightly acid, and slightly alkaline environments, with an optimum pH of 6.3–7.2. It requires the presence of certain negative ions for activation.

Use: Biochemical research.

amylose. The inner, relatively soluble portion of starch granules. Amylose is a hexosan, a polymer of glucose, and consists of long, straight chains of glucose units joined by a 1,4-glycosidic linkage. It stains blue with iodine. Microcrystalline amylose is available chiefly as a food ingredient and dietary energy source.



***o*-sec-amyphenol.** $C_5H_{11}C_6H_4OH$.

Properties: Clear, straw-colored liquid. D 0.955–0.971 (30/30C), initial bp over 235.0C, final bp below 250.0C, wt/gal 8.0 lbs. Very slightly soluble in water; soluble in oil and organic solvents, flash p 219F (OC). Combustible.

Use: Dispersing and mixing agent for paint pastes, antiskinning agent for paint, varnish and oleo-resinous enamels, organic synthesis.

***p*-tert-amyphenol.** $(CH_3)_2(C_2H_5)CC_6H_4OH$.

Properties: White crystals. Mp 93C, bp 265–267C (138C at 15 mm). Slightly soluble in water; soluble in alcohol and ether, flash p 232F (111C) (OC). Combustible.

Use: Manufacture of oil-soluble resins, chemical intermediate.

***p*-tert-amyphenyl acetate.** $C_5H_{11}C_6H_4OOCCH_3$.

Properties: Colorless liquid. D 0.996 (20C), boiling range 253–272C, fruity odor, flash p 240F (115.5C). Combustible.

Use: Perfumes, flavorings.

amyl propionate. $CH_3CH_2COOC_5H_{11}$. Probably the isoamyl isomer.

Properties: Colorless, high-boiling liquid; apple-like odor. D 0.869–0.873 (20/20C); wt/gal (20C) approximately 7.25 lb; distillation range 135–175C; flash p 106F (41.1C) (OC); autoign temp 712F (377C). Miscible with most organic solvents. Flammable.

Derivation: By reacting amyl alcohol with propionic acid in the presence of sulfuric acid as a catalyst, followed by neutralization, drying, and distillation.

Hazard: Fire hazard.

Use: Perfumes, lacquers, flavors.

amyl pyromucate. See *n*-amyl furoate.

amyl salicylate. See isoamyl salicylate.

amyl sulfide. See diamyl sulfide.

amyltrichlorosilane. $C_5H_{11}SiCl_3$. A mixture of isomers.

Properties: Colorless to yellow liquid. Bp 168C, d 1.137 (25/25C), refr index 1.4152 (20C), flash p 145F (62.8C) (COC). Readily hydrolyzed by moisture with the liberation of hydrogen chloride. Combustible.

Derivation: By Grignard reaction of silicon tetrachloride and amyl magnesium chloride.

Hazard: Toxic and corrosive.

Use: Intermediate for silicones.

amyl valerate. See isoamyl valerate.

amyl valerianate. See isoamyl valerate.

amyris oil, West Indian type.

Properties: Extracted from *Amyris balsamifera* L. (Fam. *Rutaceae*). Clear, pale yellow viscous liquid; odor of sandalwood. Sol in mineral oil, propylene glycol; insol in glycerin.

Use: Food additive.

“Amytal” [Marathon]. TM for amobarbital (USP).

anabaena, aphanizomenon, and microcystis.

The three genera of blue-green bacteria that are toxic to animals and are known as “annie, fannie and mike” by water treatment professionals.

anabasin. (neonicotine; 2-(3-pyridyl)piperidine). $C_{10}H_{14}N_2$. A naturally occurring alkaloid.

Properties: Colorless liquid, darkens on exposure to air. Bp 270C, fp 9C, d 1.046 (20/20C), refr index 1.5430 (20C). Miscible with water; soluble in alcohol and ether.

Derivation: (1) Extraction from *Anabasis aphylla* and *Nicotiana glauca*, (2) synthetic.

Use: Insecticide.

anabolism. The phase of intermediary metabolism concerned with the energy-requiring biosynthesis of cell components from smaller precursors.

anacardic acid. $C_{22}H_{32}O_3$. The chief component of cashew nutshell oil.

anacardium gum. See cashew gum.

Anacyclus pyrethrum. A prostrate perennial shrub (family Asteraceae) that is endemic to morocco, the flowers are a source of pyrethrin.

anaerobe. An organism that lives without oxygen and uses another chemical species as a terminal electron acceptor. Obligate anaerobes die when exposed to oxygen; facultative anaerobes can live in both aerobic and anaerobic environments.

anaerobic. Descriptive of a chemical reaction or a microorganism that does not require the presence of air or oxygen. Examples are the fermentation of sugars by yeast and the decomposition of sewage sludge by anaerobic bacteria. It is also applied to certain polymers that solidify when kept out of contact with air.

See "Loctite" [Henkel]; bacteria; botulism.

anaerobic bacteria. Bacteria that grow only in the absence of molecular oxygen.

aneuploid. An organism or somatic cell that has a chromosome number that is not an exact multiple of the normal haploid set of chromosomes.

anagenesis. Evolutionary change along an unbranching lineage; change without speciation.

analcite. (analcime). $Na_2O \cdot Al_2O_3 \cdot 4SiO_2 \cdot 2H_2O$. A mineral, one of the zeolites.

Properties: Colorless, white, sometimes greenish-grayish, yellowish, or reddish white. Hardness 5–5.5; d 2.22–2.29.

Occurrence: Europe, U.S., Nova Scotia.

analgin-tempidone mixture. See tempalgin.

analytical chemistry. The subdivision of chemistry concerned with identification of materials (qualitative analysis) and with determination of the percentage composition of mixtures or the constituents of a pure compound (quantitative analysis).

The gravimetric and volumetric (or "wet") methods (precipitation, titration, and solvent extraction) are still used for routine work; indeed, new titration methods have been introduced, e.g., cryoscopic methods, pressure-metric methods (for reactions that produce a gaseous product), redox methods, and use of an F-sensitive electrode. However, faster and more accurate techniques (collectively called instrumental) have been developed in the last few decades. Among these are infrared, ultraviolet, and X-ray spectroscopy, where the presence and amount of a metallic element are indicated by lines in its emission or absorption spectrum; colorimetry, by which the percentage of a substance in solution is determined by the intensity of its color, chromatography of various types, by which the components of a liquid or gaseous mixture are determined by passing it through a column of porous material or on thin layers of finely divided solids, separation of mixtures in ion-exchange columns; and radioactive tracer analysis. Optical and electron microscopy, mass spectrometry, microanalysis, nuclear magnetic resonance (NMR), and nuclear quadrupole resonance (NQR) spectroscopy all fall within the area of analytical chemistry. New and highly sophisticated techniques have been introduced in recent years, in many cases replacing traditional methods.

See spectroscopy; nuclear magnetic resonance; nuclear quadrupole resonance spectroscopy; chromatography; fiber, optical; supercritical fluid.

anandamide. A fat produced by the brain that stimulates the same receptors as THC (1-*trans*- Δ^9 -tetrahydrocannabinol), the psychoactive substance in marijuana and hashish.

See *n*-(2-hydroxyethyl)-5,8,11,14-eicosatetraenamide (all-*z*)-.

anaphoresis. The migration of dispersed particles under the influence of an electrical field toward an anode.

anaphylaxis. Abnormal reaction to a second injection of a foreign protein, e.g., penicillin. It is an extreme form of allergy which often has serious consequences (swelling of tissues) and has been known to be fatal.

anaplerotic reaction. An enzyme-catalyzed reaction that can replenish the supply of intermediates in a metabolic pathway, most commonly the citric acid cycle.

anatase. (octahedrite). A natural crystallized form of titanium dioxide, d 3.8, refr index 2.5, mp 1560C.

anavenin. (anavenom). A toxoid of snake venom. A venom that retains its antigenic activity following detoxification by formaldehyde.

ANDALUSITE

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andalusite. Al_2OSiO_4 . A natural silicate of aluminum.

Properties: Gray, greenish, reddish, or bluish in color. D 3.1–3.2, hardness 7–7.5.

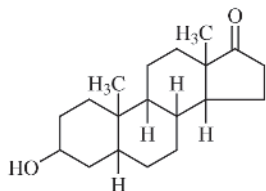
Occurrence: Massachusetts, Connecticut, California, Nevada, Europe, South Africa, Australia.

Use: Constituent of sillimanite refractories, spark-plug insulators, laboratory ware, superrefractories.

androgen. A male sex hormone. The androgenic hormones are steroids and are synthesized in the body by the testis, the cortex of the adrenal gland, and, to a slight extent, by the ovary.

androstenolone. See DHEA.

androsterone. $\text{C}_{19}\text{H}_{30}\text{O}_2$. An androgenic steroid, metabolic product of testosterone. The international unit (IU) of androgenic activity is defined as 0.1 mg androsterone.



Properties: Crystalline solid. Mp 185–185.5C, sublimes in high vacuum. Dextrorotatory in solution. Not precipitated by digitonin. Practically insoluble in water; soluble in most organic solvents.

Derivation: Isolation from male urine, synthesis from cholesterol.

Use: Medicine, biochemical research.

Andrussow oxidation. Ammonia and methane are oxidized with air in the presence of platinum catalyst to form hydrogen cyanide. Side reactions are hydration of methane to carbon dioxide and hydrogen, and oxidation of methane and ammonia to carbon monoxide and nitrogen. The reaction is strongly exothermic. The process has been elaborated wherever natural gas is abundant.

anesthetic. A chemical compound that induces loss of sensation in a specific part or all of the body. A brief classification of the more important agents is as follows:

(A) General

(1) Hydrocarbons

(a) Cyclopropane (USP). Effective in presence of substantial proportions of oxygen; flammable.

(b) Ethylene (USP). Rapid anesthesia and rapid recovery; flammable.

(2) Halogenated hydrocarbons

(a) Chloroform. Nonflammable. Its use is being abandoned because of its high toxicity.

(b) Ethyl chloride. A gas at room temperature, liquefies at relatively low pressure. Applied as a stream from container directly on tissue. Sometimes used in gaseous form as inhalation-type general anesthetic. Flammable.

(c) Trichloroethylene. Toxic and flammable. Used as general anesthetic since 1934.

(3) Ethers

(a) Ethyl ether (USP). First anesthetic used in surgery (1846), now largely replaced with less dangerous types. Highly flammable, explodes in presence of spark or open flame.

(b) Vinyl ether. A liquid having many of the physiological properties of ethylene and ethyl ether. Highly flammable.

(4) Miscellaneous

(a) Tribromoethanol. Basal anesthetic, supplemented by an inhalation type when general anesthesia is needed. Ingredient of Avertin.

(b) Nitrous oxide. Originally prepared by Priestley in 1772 (laughing gas); first used as anesthetic by Humphry Davy in 1800. Used (with oxygen) largely for dental surgery. Nonflammable.

(c) Barbiturates.

(B) Local

(1) Alkaloids (cocaine).

(2) Synthetic products (procaine group, e.g., "Novocain" [*Hospira*]); alkyl esters of aromatic acids (topical).

(3) Quinine hydrochloride.

anesthetic gas. (nitrous oxide; dinitrogen monoxide; hyponitrous acid anhydride; laughing gas).

CAS: 10024-97-2. N_2O . Any respirable gas that effects general anesthesia upon controlled inhalation.

Properties: Nonflammable, colorless gas with a slightly sweet odor; Molecular weight of 44.0; boiling point of -127F .

Hazard: Dyspnea; drowsiness, headache; asphyxia; reproductive effects; liquid frostbite.

Use: Anesthetic, analgesic, a food aerosol in the preparation of whipped cream.

anethole. (anise camphor; *p*-methoxypropenylbenzene; *p*-propenylanisole). $\text{CH}_3\text{CH}=\text{CHC}_6\text{H}_4\text{OCH}_3$.

Properties: White crystals; sweet taste; odor of oil of anise. Affected by light. D 0.983–0.987, refr index 1.557–1.561, optical rotation 0.08, mp 22–23C, distillation range 234–237C. Soluble in 8 volumes of 80% alcohol, 1 volume of 90% alcohol; almost immiscible with water.

Derivation: By crystallization from anise or fennel oils; synthetically from *p*-cresol.

Grade: USP, technical, FCC.

Use: Perfumes, particularly for dentifrices, flavors, synthesis of anisic aldehyde, licorice candies, color photography (sensitizer in color-bleaching process), microscopy.

Anfinsen, Christian B. (1916–1995). An American biochemist who won the Nobel Prize for chemistry in 1972. His work involved the molecular basis of evolution and the chemistry of enzymes. He works with Moore and Stein. His doctorate was granted from Harvard.

ANFO. A high explosive based on ammonium nitrate.
See explosive, high.

angelic acid. (*cis*-2-methyl-2-butenoic acid; α -methyl-crotonic acid). $\text{CH}_3\text{CH}:\text{C}(\text{CH}_3)\text{COOH}$. The *cis* isomer of tiglic acid.

Properties: Colorless needles or prismatic crystals; spicy odor. D 0.9539 (76/4C), mp 45C, bp 185C, refr index 1.4434 (47C). Soluble in alcohol, ether, and hot water.

Derivation: From the root of *Angelica archangelica* or from the oil of *Anthemis nobilis* by distillation.

Use: Flavoring extracts.

angelica oil.

Properties: Essential oil; strong aromatic odor; spicy taste. D 0.853–0.918, optical rotation +16 to +41. Soluble in alcohol. Chief known constituents: phellandrene, valeric acid. Combustible.

Derivation: Distilled from the roots and seeds of *Angelica archangelica* found principally in Europe.

Grade: Technical, FCC.

Use: Preparation of liqueurs, perfumery.

angelica seed oil.

Properties: Extracted from seeds of *Angelica archangelica* L. A light-yellow liquid; sweet taste. Sol in fixed oils; sltly sol in mineral oil; insol in glycerin, propylene glycol.

Use: Food additive.

Angio-Conray. An 80% solution of sodium iothalamate used in diagnostic medicine.

angiotensin. (angiotenin; hypertensin). A peptide found in the blood, important in its effect on blood pressure. Both a decapeptide and an octapeptide are known. Their amino acid sequences and hence the complete structures have been established.

angiotensin II. ((3S)-3-amino-4-[[[(2S)-5-(diaminomethylideneamino)-1-[[[(2S)-1-[[[(2S,3S)-1-[[[(2S)-1-[(2S)-2-[(2S)-1-hydroxy-1-oxo-3-phenylpropan-2-yl]carbamoyl]pyrrolidin-1-yl]-3-(1H-imidazol-5-yl)-1-oxopropan-2-yl]amino]-3-methyl-1-oxopentan-2-yl]amino]-3-(4-hydroxyphenyl)-1-oxopropan-2-yl]amino]-3-methyl-1-oxobutan-2-yl]amino]-3-methyl-1-oxobutan-2-yl]amino]-1-oxopentan-2-yl]amino]-1-oxopentan-2-yl]amino]-4-oxobutanoic acid.

CAS: 53-73-6. $\text{C}_{49}\text{H}_{70}\text{N}_{14}\text{O}_{11}$. A octopeptide with eight amino acid residues that is a powerful vasoconstrictor and stimulator of aldosterone secretion from the adrenal cortex.

Derivation: Formed from angiotensin I, which is produced by cleavage of the protein angiotensinogen in a reaction catalyzed by renin secreted by the kidneys.

angiotenin. See angiotensin.

Ångstrom. (Å). A unit of length almost one one-hundred millionth (10^{-8}) centimeter. The Ångstrom is defined in terms of the wavelength of the red line of cadmium (6438.4696 Å). Used in stating distances between atoms, dimensions of molecules, wavelengths of short-wave radiation, etc.
See nanometer.

angular aldehyde. The aldehyde group linked to carbon 13 between rings C and D of the steroid nucleus in aldosterone.

anhydrase. An enzyme that catalyzes the removal of water from a compound; most such enzymes are now known as hydrases, hydrolyases, or dehydratases.

anhydride. A chemical compound derived from an acid by elimination of a molecule of water. Thus, sulfur trioxide (SO_3) is the anhydride of sulfuric acid (H_2SO_4), carbon dioxide (CO_2) is the anhydride of carbonic acid (H_2CO_3), and phthalic acid [$\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$] minus water gives phthalic anhydride [$\text{C}_6\text{H}_4(\text{CO}_2)\text{O}$]. Not to be confused with anhydrous.

anhydrite. CaSO_4 . A natural calcium sulfate usually occurring as compact granular masses and resembling marble in appearance. Differs from gypsum in hardness and lack of hydration.

8,9-anhydro-4''-deoxy-3'-n-desmethyl-3'-n-ethylerythromycin b-6,9-hemiacetal.

CAS: 150785-53-8. $\text{C}_{38}\text{H}_{67}\text{NO}_{10}$.

Hazard: A poison.

anhydroenneheptitol. (AEH; 4-hydroxy-2H-pyran-3,3,5,5(4H,6H)tetramethanol).



Use: Alkyd resins, rosin esters, urethane coatings and foams, surfactants, lubricating oil additives.

anhydrous. Descriptive of an inorganic compound that does not contain water either adsorbed on its surface or combined as water of crystallization. Do not confuse with anhydride.

anhydrous ammonia. (aqua ammonia; synthetic ammonia; azine).
CAS: 7664-41-7. H_3N .

ANHYDROUS BORAX

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Properties: Colorless gas with a pungent, suffocating odor, usually liquefied under high pressure; molecular weight of 17.0; boiling point of -28°F .

Use: Nitrogen fertilizer; chemical feed stock for industrial production of all other nitrogen fertilizers.

anhydrous borax. (dehydrated borax; anhydrous sodium borate; anhydrous sodium borax; 4-octylbenzoic acid).

CAS: 1330-43-4. $\text{B}_4\text{Na}_2\text{O}_7$.

Properties: White, hygroscopic, nonflammable, free-flowing crystalline substance.

Hazard: Toxic.

Use: Herbicide, manufacture of glass, enamels and ceramics.

anhydrous cupric sulfate. CuO_4S

Properties: Hygroscopic; grayish-white substance consisting of rhombic crystals or powder; water soluble.

Hazard: Toxic; highly irritant.

Use: Fungicide, to detect and remove water from organic compounds.

anhydrous hydrogen fluoride. (anhydrous hydrofluoric acid; aqueous hydrogen fluoride).

CAS: 7664-39-3. HF.

Properties: Extremely acidic substance that forms a weak acid in aqueous solution; colorless gas or fuming liquid below 67°F with a strong, irritating odor; molecular weight of 20.0; boiling point of 67°F .

Hazard: Toxic; corrosive; can cause painful burns.

anidex. A synthetic fiber designated by the FTC as a cross-linked polyacrylate elastomer.

anileridine. (ethyl-1-(*p*-aminophenethyl)-4-phenylisonipeccate). $\text{C}_{22}\text{H}_{28}\text{N}_2\text{O}_2$.

Properties: White crystalline powder; odorless. Oxidizes and darkens in air and on exposure to light. Exhibits polymorphism of two crystalline forms observed, one melts at approximately 80°C and the other at approximately 89°C . Soluble in alcohol and chloroform; very slightly soluble in water.

Grade: NF.

Hazard: Addictive.

Use: Medicine (narcotic).

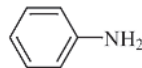
anilide. (2-chloro-*N*-[2-(4-chlorophenyl)phenyl]pyridine-3-carboxamide). $\text{C}_{18}\text{H}_{12}\text{Cl}_2\text{N}_2\text{O}$. Any of a class of amines in which the hydrogen of the amido group is replaced by a phenyl group. These are *N*-acyl derivatives of aniline.

anilide herbicide.

Use: Pre- and postemergence herbicides to control annual grasses and broadleaved weeds in crops.

aniline. (aniline oil; phenylamine; aminobenzene).

CAS: 62-53-3. $\text{C}_6\text{H}_5\text{NH}_2$. One of the most important of the organic bases, the parent substance for many dyes and drugs.



Properties: Colorless, oily liquid; characteristic odor and taste; rapidly becomes brown on exposure to air and light. Vapors will contaminate food-stuffs and damage textiles. D 1.0235, solidifies at -6.2°C , bp 184.4°C , wt/gal 8.52 lb (20°C), refr index 1.5863 (20°C), flash p 158°F (70°C) (CC), autoign temp 1140°F (615°C). Soluble in alcohol, ether, and benzene; soluble in water.

Derivation: By (1) catalytic vapor-phase reduction of nitrobenzene with hydrogen; (2) reduction of nitrobenzene with iron filings using hydrochloric acid as catalyst; (3) catalytic reaction of chlorobenzene and aqueous ammonia; (4) ammonolysis of phenol (Japan).

Grade: Commercial, CP.

Hazard: An allergen. Toxic if absorbed through the skin. Combustible. Skin irritant. Questionable carcinogen.

Use: Rubber accelerators and antioxidants, dyes and intermediates, photographic chemicals (hydroquinone), isocyanates for urethane foams, pharmaceuticals, explosives, petroleum refining, diphenylamine, phenolics, herbicides, fungicides.

aniline acetate. $\text{C}_6\text{H}_5\text{NH}_2 \cdot \text{CH}_3\text{COOH}$.

Properties: Colorless liquid, becomes dark with age; on standing or heating is converted gradually to acetanilide. D 1.070–1.072. Miscible with water and alcohol. Combustible.

Use: Organic synthesis.

aniline, arsenate. See arsenic acid, aniline salt.

aniline black. A black dye developed on cotton and other textiles from a bath containing aniline hydrochloride, an oxidizing agent (usually chromic acid), and a catalyzer (usually a vanadium or copper salt).

Hazard: See aniline.

aniline blue. (disodium 3-(aminomethyl)-2-[[4-(2-sulfoanilino)phenyl]-4-(2-sulfonatophenyl)iminocyclohexa-2,5-dien-1-ylidene]methyl]benzenesulfonate).

$\text{C}_{32}\text{H}_{25}\text{N}_3\text{Na}_2\text{O}_9\text{S}_3$

Properties: A mixture of sulfonated triphenylmethane dyes.

Use: A connective tissue stain and counterstain.

aniline chloride. See aniline hydrochloride.

aniline-2,4-disulfonic acid. See 4-amino-m-benzenedisulfonic acid.

aniline-2,5-disulfonic acid. See 2-amino-*p*-benzene-3,4'-disulfonic acid.

aniline dye. Any of a large class of synthetic dyes made from intermediates based on or made from aniline. Most are somewhat toxic and irritating to eyes, skin, and mucous membranes. They are generally much less toxic than the intermediates from which they are derived.

aniline hydrochloride. (aniline salt; aniline chloride). $C_6H_5NH_2 \cdot HCl$.

Properties: White crystals; commercial product frequently greenish in appearance; darkens in light and air. D 1.2215, mp 198C, bp 245C. Soluble in water, alcohol, and ether.

Derivation: By (1) passing a current of dry hydrogen chloride gas into an ethereal solution of aniline, (2) neutralizing aniline at 100C with concentrated hydrochloric acid and subsequent crystallization.

Hazard: See aniline.

Use: Intermediates, dyeing and printing, aniline black.

aniline ink. A fast-drying printing ink used on kraft paper, cotton fabric, cellophane, polyethylene, etc. The name is due to the fact that original inks for this purpose were solutions of coal tar dyes in organic solvents. Modern inks usually employ pigments rather than dyes and are of two types: spirit inks containing organic solvent as the vehicle, and emulsion inks in which water is the main vehicle.

aniline point. The lowest temperature at which equal volumes of aniline and the test liquid are miscible. Cloudiness occurs on phase separation. Used as a test for components of hydrocarbon fuel mixtures.

aniline salt. See aniline hydrochloride.

***p*-anilinesulfonic acid.** See sulfanilic acid.

aniline yellow. See *p*-aminoazobenzene.

1-anilino-4-hydroxyanthraquinone.

$C_6H_4(CO)_2C_6H_2(OH)NHC_6H_5$ (tricyclic).
A chemical intermediate.

anilinophenol. See *p*-hydroxydiphenylamine.

anilophos.

CAS: 64249-01-0. $C_{13}H_{19}ClNO_3PS_2$.

Hazard: Moderately toxic by ingestion and skin contact.

Use: Agricultural chemical.

animal black. See bone black.

animal diastase. See amylopsin.

animal oil. See bone oil.

animal starch. See glycogen.

anion. An ion having a negative charge, anions in a liquid subjected to electric potential collect at the positive pole or anode. Examples are hydroxyl, OH^- ; carbonate, CO_3^{2-} ; phosphate, PO_4^{3-} .

anionic detergent. Any detergent in which the surface activity moiety bears a negative charge at neutral pH.

***o*-anisaldehyde.** (*o*-methoxybenzaldehyde; *o*-anisic aldehyde).

CAS: 135-02-4. $C_6H_4(OCH_3)CHO$.

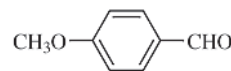
Properties: White to light-tan solid; burned, slightly phenolic odor. Bp 238C, mp (two crystalline forms) 38–39C and 3C, d (liquid) 1.1274 (25/25C), (solid) 1.258 (25/25C), refr index 1.5608 (20C), flash p 244F (117C). Insoluble in water; soluble in alcohol. Combustible.

Grade: 95% (min).

Use: Intermediate.

***p*-anisaldehyde.** (aubepine; *p*-anisic aldehyde; *p*-methoxybenzaldehyde).

CAS: 123-11-5. $C_6H_4(OCH_3)CHO$.



Properties: Colorless to pale yellow liquid; odor of hawthorn. D 1.119–1.122, refr index 1.570–1.572, mp OC, bp 248C. Insoluble in water; soluble in 5 volumes of 50% alcohol. Combustible.

Derivation: Obtained from anethole or anisole by oxidation.

Grade: Liquid and crystals, the latter being the disulfite compound.

Use: Perfumery, intermediate for antihistamines, electroplating, flavoring.

(-)-anisatin.

CAS: 5230-87-5. $C_{15}H_{20}O_8$.

Hazard: Moderately toxic by ingestion.

Source: Natural product.

anise alcohol. See anisic alcohol.

anise alcohol. (4-methoxybenzenmethanol; *p*-methoxybenzyl alcohol; anisyl alcohol; 4-methoxyphenyl)methanol).

CAS: 105-13-5. $C_8H_{10}O_2$.

Properties: Organic liquid; nearly insoluble in water; freely soluble in ethanol and ethyl ether.

Hazards: Extremely toxic.

anise camphor. See anethole.

anise oil. (anise seed oil; aniseed oil).

See anethole.

ANISIC ACID

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anisic acid. (*p*-methoxybenzoic acid). $\text{CH}_3\text{OC}_6\text{H}_4\text{COOH}$.

Properties: White crystals or powder. D 1.385 (4C), mp 184C, bp 275–280C. Soluble in alcohol and ether; almost insoluble in water.

Derivation: Oxidation of anethole.

Use: Repellent and ovicide.

anisic alcohol. (anisyl alcohol; anise alcohol; *p*-methoxybenzyl alcohol). $\text{CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OH}$.

Properties: Solidifies at room temperature; floral odor. D 1.111–1.114, refr index 1.541–1.545, boiling range 255–265C. Soluble in 1 volume of 50% alcohol; insoluble in water. Combustible.

Derivation: Obtained from anisic aldehyde by reduction.

Grade: Technical, FCC.

Use: In perfumery for light floral odors, pharmaceutical intermediate, flavoring.

anisic aldehyde. See anisaldehyde.

***o*-anisidine.** (*o*-methoxyaniline; *o*-aminoanisole).

CAS: 90-04-0. $\text{CH}_3\text{OC}_6\text{H}_4\text{NH}_2$.

Properties: Reddish or yellowish oil; becomes brownish on exposure to air, volatile with steam. D 1.097 (20C), bp 225C, fp 5C. Soluble in dilute mineral acid, alcohol, and ether; insoluble in water.

Derivation: (1) Reduction of *o*-nitroanisole with tin or iron and hydrochloric acid; (2) heating *o*-aminophenol with potassium methyl sulfate.

Method of purification: Steam distillation.

Grade: 99% (1% max moisture).

Hazard: Strong irritant. Toxic when absorbed through the skin. Possible carcinogen.

Use: Intermediate for azo dyes and for guaiacol.

***p*-anisidine.** (*p*-methoxyaniline; *p*-aminoanisole).

CAS: 104-94-9. $\text{CH}_3\text{OC}_6\text{H}_4\text{NH}_2$.

Properties: Fused, crystalline mass. Crystallizing point 57.2C (min), d 1.089 (55/55C), bp 242C. Soluble in alcohol and ether; slightly soluble in water.

Derivation: (1) Reduction of *p*-nitroanisole with iron filings and hydrochloric acid; (2) methylation of *p*-aminophenol.

Grade: Technical.

Hazard: Strong irritant. Toxic when absorbed through the skin. Questionable carcinogen.

Use: Azo dyestuffs, intermediate.

anisindione. (2,*p*-anisyl-1,3-indandione).

$\text{C}_{16}\text{H}_{12}\text{O}_3$.

Properties: Pale yellow crystals. Mp 156–157C.

Grade: ND.

Use: Anticoagulant (blood).

anisole. (methylphenyl ether; methoxybenzene).

CAS: 100-66-3. $\text{C}_6\text{H}_5\text{OCH}_3$.

Properties: Colorless liquid; aromatic odor. D 0.999 (15/15C), fp –37.8C, bp 155C, refr index 1.5170

(20C), flash p 125F (51.6C) (OC). Soluble in alcohol and ether; insoluble in water. Combustible.

Derivation: From sodium phenate and methyl chloride, heating phenol with methanol.

Use: Solvent, perfumery, vermicide, intermediate, flavoring.

anisomycin. $\text{C}_{14}\text{H}_{19}\text{NO}_4$.

Properties: Needles. Mp 140C. Slightly soluble in water; soluble in low-molecular weight alcohols, ketones, and chloroform; slightly soluble in organic solvents. Water solutions are stable at room temperature over a broad range of pH.

Use: Fungus inhibitor, mildew preventive in vegetables.

anisotropic. Descriptive of crystals whose index of refraction varies with the direction of the incident light. This is true of most crystals, e.g., calcite (Iceland spar); it is not true of isometric (cubic) crystals, which are isotropic.

anisotropy factor. The coefficient by which the contribution of one absorption band to the ordinary refraction has to be multiplied in order to obtain the rotatory contribution of the same band.

anisoyl chloride.

CAS: 100-07-2. $\text{CH}_3\text{OC}_6\text{H}_4\text{COCl}$.

Properties: Clear crystals or amber liquid. Mp 22C, bp 262–263C. Soluble in acetone and benzene; decomposed by water or alcohol. Fumes in moist air.

Use: Intermediate for dyes and medicines.

Hazard: Solutions corrosive to tissue. Explosion risk when in closed containers due to pressure caused by decomposition at room temperature.

***n*-anisoyl-gaba.**

CAS: 72432-14-5. $\text{C}_{12}\text{H}_{15}\text{NO}_4$.

Hazard: A poison by ingestion.

anisyl acetate. (*p*-methoxybenzyl acetate). $\text{CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{COCH}_3$.

Properties: Colorless liquid; lilac odor. D 1.104–1.107, refr index 1.514–1.516. Soluble in 4 volumes of 60% alcohol. Combustible.

Derivation: Reaction of anisic alcohol with acetic anhydride.

Grade: Technical, FCC.

Use: Perfumery, flavoring.

anisylacetone. (generic name for 4-(*p*-methoxyphenyl)-2-butanone). $\text{CH}_3\text{OC}_6\text{H}_4\text{C}_2\text{H}_4\text{COCH}_3$.

Properties: A colorless to pale-yellow liquid. Mp 8C. Combustible.

Use: In insect attractants, organic synthesis, flavoring.

anisyl alcohol. See anisic alcohol.

***p*-anisylchlorodiphenylmethane.** (*p*-methoxytriphenylmethyl chloride). $\text{CH}_3\text{OC}_6\text{H}_4\text{C}(\text{C}_6\text{H}_5)_2\text{Cl}$.

Properties: Mp 122–124C, mw 308.81.

Grade: Research.

Hazard: Skin and eye irritant.

Use: NH_2^- protecting reagent for amino acids in oligonucleotide synthesis.

anisyl formate. (*p*-methoxybenzyl formate). $\text{CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OCOH}$.

Properties: Colorless liquid; lilac odor. D 1.139–1.141. Soluble in 5.5 volumes of 70% alcohol. Combustible.

Use: Perfumery, flavoring.

2,*p*-anisyl-1,3-indandione. See anisindione.

annatto. $\text{C}_{27}\text{H}_{34}\text{O}_4$. Vegetable dye containing ethyl bixin.

Derivation: From the seeds of *Bixa orellana*.

Occurrence: South America, West Indies, India.

Use: (As extract) coloring margarine, sausage casings, etc.; food-product marking inks. For details, see regulations of Meat Inspection Division, USDA and FDA regulations.

See bixin.

anneal. Generally synonymous with “hybridize.”

annealing. Maintenance of glass or metal at a specified temperature for a specific length of time (at least 3 days for plate glass) and then gradual cooling at a predetermined rate. This treatment removes the internal strains resulting from previous operations and eliminates distortions and imperfections. A clearer, stronger, and more uniform material results.

See temper.

annealing point, glass. The temperature at which the internal stress in glass is substantially relieved within 15 minutes.

annellation. A chemical reaction in which one cyclic or ring structure is added to another to form a polycyclic compound.

annotation. Adding pertinent information such as the gene coded for, the amino acid sequence, or other commentary to the database entry of raw sequence of DNA bases.

See bioinformatics.

Ano. A series of dyestuffs used for coloring anodized aluminum.

See anodic coating.

anode. The positive electrode of an electrolytic cell, to which negatively charged ions travel when an electric current is passed through the cell. Such

anodes are usually made of graphite or other forms of carbon, although titanium has been successfully introduced in the chloralkali industry. In a primary cell (battery or fuel cell), the anode is the negative electrode.

See cathode; electrode.

anode mud. Residue obtained from the bottom of a copper or other plating bath. In the electrolytic refining of copper, the anode mud contains the relatively inert metals platinum, silver, and gold and is usually collected and treated for the recovery of these metals and other rare elements.

anode process. See electrophoresis.

anodic coating. (anodizing). The electrolytic treatment of aluminum, magnesium, and a few other metals as a result of which heavy, stable films of oxides are formed on their surfaces. A thin oxide film will form on an aluminum surface without special treatment on exposure of the metal to air. This provides excellent resistance to corrosion. This fact led to the development of electrochemical processes to produce much thicker and more effective protective and decorative coatings. The chief electrolytes used are sulfuric, oxalic, and chromic acids. The metal acts as the anode. Such anodic coatings are hard and have good electrical insulating properties. Their ability to absorb dyes and pigments makes it possible to obtain finishes in a complete range of colors, including black. The luster of the underlying metal gives them a metallic sheen; colorants can be used to reproduce the color of any metal with which the aluminum might be used. Anodized coatings can be used as preparatory treatments to electroplating; copper, nickel, cadmium, silver, and iron have been successfully deposited over oxide coatings.

See aluminum.

anodizing. See anodic coating.

anomalous dispersion. The inversion of the usual change of refractive index with wavelength near an absorption band.

anomer. A special kind of diastereoisomer (or epimer) occurring in some sugars and other substances having asymmetric carbon atoms.

anomeric. Denoting sugar modifications that differ only in that the H and OH, or H and OMe on the reducing carbon are reversed.

anomers. Two stereoisomers (α and β) of a given sugar that differ only in the configuration about the carbonyl (anomeric) carbon atom (carbon 1 for pyranoses and carbon 2 for furanoses).

anoxomer.
CAS: 60837-57-2.

Properties: A polymer consisting of 1,4-benzenediol, 2-(1,1-dimethylethyl)-polymer with diethylbenzene, 4-(1,1-dimethylethyl)phenol, 4-methoxyphenol, 4,4'-(1-methylethylidene)bis(phenol) and 4-methylphenol.

Use: Food additive.

ANPO. Abbreviation for α -naphthylphenyloxazole.

Anrade's theory. This states that viscosity is the result of transportation of momentum in collisions of molecules.

ANSI. See American National Standards Institute.

antabuse.

Use: Drug for treatment of alcoholism. See tetraethylthiuram disulfide.

antacid. Any mildly alkaline substance, such as sodium bicarbonate, taken internally or in water solution to neutralize excess stomach acidity.

antagonist, structural. (antimetabolite). An organic compound that is structurally related to a biologically active substance (enzyme, nucleic acid, amino acid, etc.) and that acts as an inhibitor of its growth and development. Such biological antagonism exists between sulfa drugs and *p*-aminobenzoic acids, and also between histamine and a group of compounds collectively called antihistamines. One of the most important of these from an agricultural standpoint is imidazole, which, together with similar compounds, is used to "antagonize" the metabolism of insects, especially those attacking fabrics; it is also being used in irrigation waters to protect plants from pests. Structural antagonists have important medical applications in the complex field of allergic disease. See antihistamine; anticoagulant; antigen-antibody.

Antarcticine. A high molecular weight glycoprotein obtained from an Antarctic strain of bacteria.

Use: Provides stability to proteins and lipid membranes exposed to extreme cold and dryness.

Antaron FC-34. A high-foaming, water-soluble, amphoteric surfactant with soaplike qualities, a complex fatty amido compound 40% active.

Use: Fulling agent and detergent for woolen and worsted fabrics; effective under neutral, acid, and alkaline conditions; recommended for use in bubble baths, detergents, and in soaps for dedusting purposes.

antazoline. $C_{17}H_{19}N_3$.

Properties: White, odorless crystalline powder with bitter taste. Mp 120C. Sparingly soluble in

alcohol and water; practically insoluble in benzene and ether.

Use: Medicine (antihistamine). Available as hydrochloride and phosphate.

anteiso- Prefix denoting an isomer (usually a fatty acid or derivative) that has a single, simple branching attached at the third carbon from the end of a straight chain, in distinction to an isocompound, where the attachment is to the second carbon from the end. For example, isododecanoic acid would be $CH_3CH(CH_3)(CH_2)_8COOH$, while anteisododecanoic acid would be $CH_3CH_2CH(CH_3)(CH_2)_7COOH$.

anthelmintic. An agent used in veterinary medicine as a vermifuge.

anthelmycin. USAN name for an antibiotic substance produced by *Streptomyces longissimus*.

antheridiol. $C_{29}H_{42}O_5$.

Properties: Colorless, fine crystals. Mp 250C. Slightly soluble in water; soluble in warm methanol.

Use: A plant hormone having a specific sex function, it is secreted by certain water molds. It has been used to modify plant fertility. Said to be the first plant sex hormone to be discovered (1942).

anthocyanin. A flavonoid plant pigment that accounts for most of the red, pink, and blue colors in plants, fruits, and flowers. Water soluble. See flavonoid.

anthonaphthol as. See C.I. azoic coupling component 2.

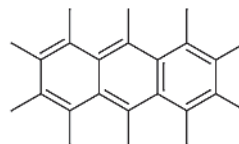
anthopyllite. $(Mg,Fe)_7Si_8O_{22}(OH)_2$. A natural magnesium-iron silicate. See asbestos.

anthopyllite. $(Mg,Fe)_7Si_8O_{22}(OH)_2$. A natural magnesium-iron silicate. See asbestos.

anthracene.

CAS: 120-12-7. $C_{14}H_{10}$.

Properties: Yellow crystals with blue fluorescence. D 1.25 (27/4C), mp 217C, bp 340C, fp 250F (121C) (CC). Soluble in alcohol and ether; insoluble in water. Combustible. It has semiconducting properties.



Derivation: (1) By salting out from crude anthracene oil and draining. The crude salts are purified by

pressing and finally phenanthrene and carbazole are removed by the use of various solvents. (2) By distilling crude anthracene oil with alkali carbonate in iron retorts, the distillate contains only anthracene and phenanthrene. The latter is removed by carbon disulfide.

Impurities: Phenanthrene, carbazole, and chrysene.

Method of purification: By sublimation with superheated steam or by crystallization from benzene followed by sublimation; for very pure crystals, zone melting of solid anthracene.

Grade: Commercial (90–95%), pure crystals.

Hazard: A questionable carcinogen.

Use: Dyes, alizarin, phenanthrene, carbazole, anthraquinone, calico printing, a component of smoke screens, scintillation counting crystals, organic semiconductor research.

anthracene oil. A coal tar fraction boiling in the range 270–360C, a source of anthracene and similar aromatics. Also used as a wood preservative and pesticide, except on food crops.

Hazard: A carcinogen.

1,8,9-anthracenetriol. See anthralin.

anthracite. See coal.

anthragallic acid. See anthragalloyl.

anthragalloyl. (1,2,3-trihydroxyanthraquinone; anthragallic acid). $C_6H_4(CO)_2C_6H(OH)_3$. Tricyclic.

Properties: Brown powder. Soluble in alcohol, ether, and glacial acetic acid; slightly soluble in water and chloroform. Sublimes at 290C.

Derivation: Product of the reaction of benzoic, gallic, and sulfuric acids.

Use: Dyeing.

Anthragen. A series of lake colors. Used for printing inks, wallpaper, coated paper, paint, rubber, and organic plastics.

Anthralan. A series of acid dyestuffs. Used on wool.

anthralin. (1,8,9-anthracenetriol; 1,8-dihydroxyanthranol). $C_{14}H_{10}O_3$.

Properties: Odorless, tasteless, yellow powder. Mp 176–181C. Filtrate from water suspension is neutral to litmus. Soluble in chloroform, acetone, benzene, and solutions of alkali hydroxide; slightly soluble in alcohol, ether, and glacial acetic acid; insoluble in water. Combustible.

Derivation: By catalytic reduction of 1,8-dihydroxyanthraquinone with hydrogen at high pressure.

Grade: NF, 95%.

Hazard: Very irritating. Do not use on scalp or near eyes.

Use: Medicine (treatment of psoriasis).

anthranilic acid. (*o*-aminobenzoic acid).

CAS: 118-92-3. $C_6H_4(NH_2)(CO_2H)$.

Properties: Yellowish crystals; sweetish taste. Mp 144–146C (sublimes). Soluble in hot water, alcohol, and ether. Combustible.

Derivation: Phthalimide plus an alkaline hypobromite solution.

Grade: Technical (95–98%), 99% or better.

Hazard: Questionable carcinogen.

Use: Dyes, drugs, perfumes, and pharmaceuticals.

anthranol. (9-hydroxyanthracene). $C_{14}H_9OH$.

Properties: Crystals. Mp 120C. Soluble in organic solvents with a blue fluorescence. Changes in solution to anthrone. Combustible.

Use: Dyes.

anthranone. See anthrone.

anthrapurpurin. (1,2,7-trihydroxyanthraquinone; isopurpurin; purpurin red). $C_6H_3OH(CO)_2C_6H_2(OH)_2$. Tricyclic.

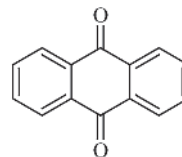
Properties: Orange-yellow needles. Mp 369C, bp 462C. Soluble in alcohol and alkalies; slightly soluble in ether and hot water.

Derivation: By fusion of anthraquinonedisulfonic acid with caustic soda and potassium chlorate; the melt is run into hot water and the anthrapurpurin precipitated by hydrochloric acid.

Use: Dyeing, organic synthesis.

anthraquinone.

CAS: 84-65-1. $C_6H_4(CO)_2C_6H_4$.



Properties: Yellow needles. D 1.419–1.438, mp 286C, bp 379–381C, flash p 365F (185C) (CC). Soluble in alcohol, ether, and acetone; insoluble in water. Combustible.

Derivation: (1) By heating phthalic anhydride and benzene in the presence of aluminum chloride and dehydrating the product; (2) by condensation of 1,4-naphthoquinone with butadiene.

Method of purification: Sublimation.

Grade: Sublimed, 30% paste (sold on 100% basis), electrical 99.5%.

Hazard: Possible carcinogen.

Use: Intermediate for dyes and organics, organic inhibitor, bird repellent for seeds.

See anthraquinone dye.

anthraquinone-1,5- and 1,8-disulfonic acids.

(rho acid, chi acid, respectively). $C_{14}H_8O_8S_2$.

Properties: (in pure state) Slightly yellow to white crystals. The technical grade is grayish-white.

ANTHRAQUINONE DYE

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Soluble in water and strong sulfuric acid. The 1,8-isomer is the more soluble. The 1,5-disulfonic acid melts with decomposition at 310–311C. The 1,8-isomer melts and decomposes at 293–294C.

Derivation: Anthraquinone is sulfonated with fuming sulfuric acid in the presence of mercury or mercuric oxide to a mixture of the 1,5- and 1,8-disulfonic acids, which are separated by fractional crystallization.

Method of purification: Fractional crystallization from strong sulfuric acid, or in the form of their alkali salts from either acid or alkaline solutions.

Grade: Technical.

Use: Dyes.

anthraquinone dye. $C_6H_4(CO)_2C_6H_4$. A dye whose molecular structure is based on anthraquinone. The chromophore groups are $=C=O^-$ and $=C=C=$. The benzene ring structure is important in the development of color. CI numbers from 58000 to 72999. These are acid or mordant dyes when OH or HSO_3 groups, respectively, are present. The anthraquinone dyes that can be reduced to an alkaline solution leuco (vat) derivative having affinity for fibers and that can be reoxidized to the dye are known as anthraquinone vat dyes. They are largely used on cotton, rayon, and silk, and have excellent properties of color and fastness.

anthrarufin. See 1,5-dihydroxyanthraquinone.

anthrax. A notifiable disease caused by *Bacillus anthracis* toxin. It occurs most commonly among domestic cattle and sheep but pigs and horses can also be affected. Humans are sometimes infected by contact with infect meat products or by direct contact with diseased animals.

Hazards: Hemorrhage and serous effusions in various organs and body cavities; extreme prostration; death.

anthrax toxin. (*Bacillus anthracis* toxin). A culture filtrate of *Bacillus anthracis* that contains at least three different substances: an edema factor, a lethal factor, and a protective antigen.

anthrone. (anthranone; 9,10-dihydro-9-oxoanthracene). $C_{14}H_{10}O$. The keto is the more stable form of anthranol.

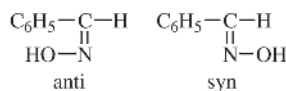
Properties: Colorless needles. Mp 156C. Insoluble in water; soluble in alcohol, benzene, and hot sodium hydroxide solutions.

Derivation: Reduction of anthraquinone with tin and hydrochloric acid.

Use: Rapid determination of sugar in body fluids, and of animal starch in liver tissue; general reagent for carbohydrates; organic synthesis.

anti-. (1) A prefix used in designating geometrical isomers in which there is a double bond between the carbon and nitrogen atoms. This prevents free

rotation, so that two different spatial arrangements of substituent atoms or groups are possible. When a given pair of these are on opposite sides of the double bond, the arrangement is called *anti-*; when they are on the same side, it is called *syn-*, as indicated below:



These prefixes are disregarded in alphabetizing chemical names. (2) A prefix meaning “against” or “opposed to,” as in antibody, antimalarial, etc.

antianxiety agent. See psychotropic drug.

antiarsenin. A nonarsenical substance thought to be secreted by the body in response to the administration of doses of arsenic trioxide (as arsenic acid) that are protective against toxic responses to a higher dosage.

antiauxin. A substance that inhibits the growth-regulating effects of an auxin, sometimes by preventing auxin transport.

antiauxin herbicide. Any of a number of growth-regulating compounds that are chemically related to auxins. These compounds have effects on cell elongation that are generally opposite to those of auxins. They stimulate root elongation and inhibit that of coleoptile segments.

antibiotic. A chemical substance produced by microorganisms that has the capacity in dilute solutions to inhibit the growth of other microorganisms or destroy them. Only approximately 20 out of several hundred known have proved generally useful in therapy. Those that are used must conform to FDA requirements. The most important groups of antibiotic-producing organisms are the bacteria, lower fungi, or molds, and actinomycetes. These antibiotics belong to very diverse classes of chemical compounds. Most of the antibiotics produced by bacteria are polypeptides (such as tyrothricin, bacitracin, polymyxin). The penicillins are the only important antibiotics produced by fungi. Actinomycetes produce a wide variety of compounds (actinomycin, streptomycin, chloramphenicol, tetracycline). The antimicrobial activity (antibiotic spectrum) of antibiotics varies greatly; some are active only on bacteria, others on fungi, still others on bacteria and fungi; some are active on viruses, some on protozoa, and some are also active on neoplasms. An organism sensitive to an antibiotic may, on continued contact with it, develop resistance and yet remain sensitive to other antibiotics. Certain antibiotics are used as direct food additives to inhibit growth of bacteria and fungi; among these are nisin, pimaricin, nystatin, and tylosin. *Note:* A

number of antibiotics have been restricted by FDA, both for direct use by humans and as additives to animal feeds. Among those are streptomycin, chloramphenicol, tetracycline, and penicillin.

See penicillin; cephalosporin; plasmid; Waksman; Fleming.

antibiotic resistance. Plasmids generally contain genes that confer on the host bacterium the ability to survive a given antibiotic. If the plasmid pBR322 is present in a host, that host will not be killed by (moderate levels of) ampicillin or tetracycline. By using plasmids containing antibiotic resistance genes, the researcher can kill off all the bacteria that have not taken up this plasmid, thus ensuring that the plasmid will be propagated as the surviving cells divide.

“Antiblaze” [Hickory]. TM for a trichloropropyl phosphate additive flame retardant.

Use: On either side of two-component rigid urethane systems and in rebonded flexible foam, coatings, and elastomers.

antiblock agent. A substance (e.g., a finely divided solid of mineral nature) that is added to a plastic mix to prevent adhesion of the surfaces of films made from the plastic to each other or to other surfaces. They are of particular value in polyolefin and vinyl films. The hard, infusible particles tend to roughen the surface and so maintain a small air space between adjacent layers of the film, thus preventing adhesion. Silicate minerals are widely used for this purpose. Another type of antiblock function is performed by high-melting waxes, which bloom to the surface and form a layer that is harder than plastic.

antibody. See antigen-antibody.

anticaking agent. An additive used primarily in certain finely divided food products that tend to be hygroscopic to prevent or inhibit agglomeration and thus maintain a free-flowing condition. Such substances as starch, calcium metasilicate, magnesium carbonate, silica, and magnesium stearate are used for this purpose in table salt, flours, sugar, coffee, whiteners, and similar products.

anticancer drug. See antineoplastic.

antichlor. Any product that serves to neutralize and remove hypochlorite or free chlorine after a bleaching operation. For many years the term was considered synonymous with sodium thiosulfate, but it may equally be applied to sodium disulfite or any other product used for the purpose.

anticholinergic. A drug or pharmaceutical that inhibits the action of acetylcholine by reactivating the cholinesterase. Examples are atropine sulfate and pralidoxime iodide.

anticipation. Each generation of offspring has increased severity of a genetic disorder; e.g., a grandchild may have earlier onset and more severe symptoms than the parent, who had earlier onset than the grandparent.

See additive genetic effects; complex trait.

anticholinesterase. (acetylcholinesterase inhibitor; cholinesterase inhibitor). Any substance that inhibits or inactivates acetylcholinesterase, thereby preventing the hydrolysis of acetylcholine. Their action leads to an accumulation of endogenous acetylcholine with a resultant hyperactivity of cholinergic neurons, which can prove lethal.

Hazard: Tremors; convulsions; respiratory failure; death.

Use: Pesticides.

anticoagulant. A complex organic compound, often a carbohydrate, that has the property of retarding the clotting or coagulation of blood. The most effective of these is heparin, which acts by interfering with the conversion of prothrombin to thrombin and by inhibiting the formation of thromboplastin. In addition to their specific clinical uses, anticoagulants have been applied with limited success to rodenticides (see warfarin). They are regarded as cumulative poisons, requiring multiple ingestions to be lethal. One type (diaphenadione) has been found to reduce blood cholesterol in experimental animals.

anticoagulant poison. An anticoagulant.

Use: To control small mammal pests.

anticoagulant rodenticide. A rodenticide that causes massive internal bleeding by virtue of its action as an anticoagulant. These rodenticides are potentially hazardous to all mammals and birds.

anticodon. A specific sequence of three nucleotides in a tRNA, complementary to a codon for an amino acid in an mRNA.

anticonvulsant. An agent used to prevent, control, or to relieve convulsions states.

anticrotalis serum. An antivenomous serum which is protective against envenomation by crocotalids.

anticurare. A chemical agent that neutralizes the myotoxic action of curare.

anticytotoxin. A substance, usually a specific antibody, that inhibits the action of a cytotoxin.

antidepressant. See psychotropic drug.

antidote. Any substance that inhibits or counteracts the effects of a poison which has entered the body by any route. Mild acids or alkalies (except

ANTIEMETIC AGENT

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sodium bicarbonate) exert neutralizing action if corrosive materials have been swallowed; for non-corrosive poisons, warm salt water or milk may be given to cause vomiting. Activated charcoal in water is effective in protecting the throat and stomach linings, except for corrosive poisons. Nothing should be administered by mouth if the subject is unconscious. Artificial respiration may be necessary. In no case should alcohol be used as an antidote. Atropine sulfate and pralidoxime iodide have been successfully used as antidotes for poisoning by cholinesterase inhibitors.

antiemetic agent. A compound usually classed as a pharmaceutical that inhibits or prevents nausea. A well-known type is dimenhydrinate ("Dramamine" [*Prestige*]) which is useful to counteract motion sickness, nausea due to pregnancy, etc. A more recent antiemetic is a benzoquinolizine derivative used for nausea resulting from anesthesia (Emete-con).

antidotoxin. An antibody that counteracts the effects of an endotoxin.

antienzyme. A substance present in the substrate that restricts or negates the catalytic activity of the enzyme on that substrate.

antiestrogen. Any substance that chemically reduces or inhibits the biological action of an estrogen.

antifertility agent. A synthetic steroid sex hormone of the type normally produced by the body during pregnancy. Said to act by simulating the conditions of pregnancy and thus suppressing ovulation, which automatically prevents conception. The hormones used are basically of two kinds: (1) progestin (synthetic progesterone) and (2) synthetic estrogen. There are also several other derivatives, all of which are much stronger than natural progesterone and estrogen when taken orally. The chemical modifications are necessary for oral potency. Injectable contraceptives that remain effective over much longer periods than the oral type are also available. The active ingredient is medoxyprogesterone acetate. Experimental work is also being done with N,N'-octaethylenediamine bis(dichloroacetamide) (Fertilysin). An estrogen-free type is available in England (chloromadinone acetate); it is said to be less effective, but with less tendency to cause blood clotting than estrogenic types.

Hazard: FDA requires that oral contraceptives carry a label warning of the tendency of these agents to form blood clots. There is also a possibility that they have other adverse side effects. *Note:* Proteins and peptides that act as enzyme inhibitors have been identified in the semen of some mammals.

antifoam agent. See defoaming agent.

antifouling paint. An organic coating formulated especially for use on the hulls and bottoms of ships, boats, buoys, pilings, and the like to protect them from attack by barnacles, teredos, and other marine organisms. The chief specific ingredient is a metallic naphthenate, e.g., copper naphthenate; mercury compounds are also used.

antifreeze. (1) Water additive. Any compound that lowers the freezing point of water. Both sodium chloride and magnesium chloride were once used, but their extreme corrosive properties made them a liability in automotive cooling systems. Methanol requires only 27% by volume for protection to -17.7°C . Due to its tendency to evaporate rapidly at operating temperatures, its flammability, and its low boiling point (63.9°C), it has been replaced by glycol derivatives which are relatively noncorrosive, nonflammable, have very low evaporation rates, and are effective heat-exchange agents. A concentration of 35% protects against freezing to -17.7°C . Ethylene and propylene glycol antifreezes can be carried in an automotive cooling system for several years without damage, and are satisfactory coolants at summer operating temperatures. Methoxypropanol has been introduced as an antifreeze-coolant for diesel engines. (2) Gasoline additive. A proprietary preparation, TM "Drygas," [*Cristy*] consists of methanol, isopropanol, or mixtures of these, that lowers the freezing point of water enough to inhibit ice formation in feed lines and carburetors. It is added directly to the gasoline.

Hazard: Poisonous. Flammable.
See coolant.

Antigen-antibody. An antibody is a blood serum protein of the globulin fraction that is formed in response to introduction of an antigen. It has a molecular weight of approximately 160,000. An antigen is an infective organism (protein) with molecular weight of at least 10,000; it is able to induce formation of an antibody in an organism into which it is introduced (by injection). Thus an animal is able to resist infections to which it has previously been exposed. The entire science of immunology is based on antigen-antibody reactions, the most outstanding feature of which is their specificity. The antibodies produced in the bloodstream can react only with the homologous antigen or with those of a similar molecular structure. As a result, the animal can destroy a particular virus or bacterium and become immune. The specificity of antigens is due not so much to the composition of the molecule as to its configuration. Certain radicals (polar and quaternary ammonium groups) seem to "mate" with corresponding complementary structures in the antibody molecule. A precipitate or agglutinate is formed by the reaction which is analogous to colloidal (catalytic) reactions in some respects, e.g., surface configuration.

See immunochemistry; Pasteur; allergen; antagonist, structural.

- antiglobulin.** An agent used to coagulate globulin.
- antihistamine.** A synthetic substance structurally analogous to histamine whose presence in minute amounts prevents or counteracts the action of excess histamine formed in body tissues. These compounds are usually complex amines of various types and also have other physiological effects and medical uses. Examples are chlorpheniramine maleate, dimenhydrinate, diphenhydramine hydrochloride, imidazole, pheniramine maleate, pyrilamine maleate, thonzylamine hydrochloride, tripeleminamine hydrochloride.
See antagonist, structural.
- antihypertensive agent.** An organic compound having the property of lowering blood pressure in animals and humans. Among the better-known types are the alkaloid reserpine and its derivative syrosingopine, guanethidine sulfate, α -methyl dopa (α -methyl-3,4-dihydroxyphenylalanine), and hydralazine. They function by various nerve-blocking mechanisms involving structural antagonism. They should be taken only by prescription.
- antiinflammatory agent.** Any of a number of drugs that prevent or inhibit inflammation of tissue. Most common of these is aspirin.
- antiinvasin.** Either of the two enzymes present in normal blood plasma that are antagonistic to hyaluronidase.
- antiknock agent.** Any of a number of organic compounds that increase the octane number of a gasoline when added in low percentages by reducing knock, especially in high-compression engines. Knock is caused by spontaneous oxidation reactions in the cylinder head, resulting in loss of power and characteristic ignition noise. Branched-chain hydrocarbon gasolines ameliorate this problem, and antiknock additives virtually eliminate it. Tetraethyl lead, the most effective of these, has been used for many years, but its contribution to air pollution has almost eliminated its use in automotive fuels. Lead-free gasolines are now used in conjunction with catalytic converters. The antiknock agents used in them are nonmetallic compounds such as methyl-*tert*-butyl ether (MTBE) or a mixture of methanol and *tert*-butyl alcohol.
See octane number; gasoline.
- antilymphocytic serum.** (ALS). An immunological suppressant for use in organ transplants. It acts to control the buildup of rejection factors in the blood that result from introduction of foreign organs into the body.
See immunochemistry.
- antimatter.** See antiparticle.
- antimetabolite.** See antagonist, structural; antihistamine; metabolite.
- antimonate.** Salt in which antimony has a valence of 5.
- antimonial lead alloy.** (hard lead). Lead alloy containing approximately 6–28% antimony. Common grades are as follows: (1) 15% antimony, resistant to sulfuric acid used in type metal; (2) national stock pile specification, 10.7–11.3% antimony; (3) battery grids, 5–11% antimony; (4) battery terminals, 4% antimony; (5) cable sheaths, 1% antimony.
- antimonic.** Adjective used for compounds in which antimony has a valence of 5, e.g., antimony pentachloride, pentasulfide, etc.
- antimonic acid.** See antimony pentoxide.
- antimonic anhydride.** See antimony pentoxide.
- antimonite.** See stibnite.
- antimonous.** (antimonious). Adjective used for compounds in which antimony has a valence of 3, as in antimony tribromide, antimony trichloride, antimony trioxide, antimony trisulfide.
- antimonous sulfide.** See antimony trisulfide.
- antimony.**
CAS: 7440-36-0. Sb (from Latin stibium). Metallic element of atomic number 51, group VA of the periodic table, aw 121.75, valences 3, 4, and 5. Two stable isotopes.
Properties: Silver-white solid. Mp 630.5C, bp 1635C. Low thermal conductivity, Mohs hardness 3 to 3.5. Oxidized by nitric acid; not attacked by hydrochloric acid in absence of air; reacts with sulfuric acid and aqua regia. Combustible. A semiconductor.
Available forms: Besides the stable metal, there are two allotropes: yellow crystals and amorphous black modifications.
Source: Ores: Stibnite, kermasite, tetrahedrite, livingstonite, jamisonite.
Occurrence: Algeria, Bolivia, China, Mexico, South Africa, Peru, Yugoslavia.
Derivation: Reduction of stibnite with iron scrap; direct reduction of natural oxide ores. About half the antimony used in the U.S. is recovered from lead base battery scrap metal.
Grade: Up to 99.999% pure, technical, powder, commercial grade in 55-lb cakes 10 × 10 × 2.5 inches.
Hazard: Use with adequate ventilation. Soluble salts are toxic.
Use: Hardening alloy for lead, especially storage batteries and cable sheaths; bearing metal; type metal; solder; collapsible tubes and foil; sheet and

ANTIMONY-124

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pipe; semiconductor technology (99.999% grade); pyrotechnics.

antimony-124. Radioactive antimony isotope. **Properties:** Half-life 60 days, radiation β and γ . The chemical form used is often antimony trichloride and oxychloride in hydrochloric acid solution. **Use:** As a tracer, especially in solid-state studies and marker of interfaces between products in pipelines. The γ ray has sufficient energy to eject neutrons from beryllium. Convenient portable neutron sources that may be reactivated in a nuclear reactor are made by irradiation of an antimony pellet encased in a beryllium shell. **Hazard:** Radioactive poison.

antimony-125. Radioactive antimony isotope. Half-life 2.4 years, emits β and γ rays. **Hazard:** Radioactive poison.

antimony black. Metallic antimony in the form of a fine powder produced by electrolysis or chemical action on an antimony salt solution. See antimony trisulfide.

antimony bromide. See antimony tribromide.

antimony, caustic. See antimony trichloride.

antimony chloride. See antimony trichloride.

antimony chloride, basic. See antimony oxychloride.

antimony dichlorotrifluoride. SbCl_2F_3 . A thick liquid stored in iron drums. Used as catalyst for fluorocarbon manufacture.

antimony fluoride. See antimony trifluoride.

antimony hydride. (stibine). CAS: 7803-52-3. SbH_3 . **Properties:** Colorless gas. Mp -88C , bp -17C . **Derivation:** Action of hydrogen chloride on antimony-metal compounds such as Zn_3Sb_2 ; also released by reduction of antimony compounds in hydrochloric acid solutions with zinc or other reducing metal. **Hazard:** Toxic.

antimony iodide. See antimony triiodide.

antimonyl. The radical or group SbO which occurs commonly in formulas of antimony compounds. Thus SbOCl is often named antimonyl chloride, and numerous other antimony compounds are sometimes named in a similar manner.

antimony lactate. CAS: 58164-88-8. $\text{Sb}(\text{C}_3\text{H}_5\text{O}_3)_3$. **Properties:** Tan-colored mass. Soluble in water. **Grade:** Technical.

Hazard: Toxic. **Use:** Mordant in fabric dyeing.

antimony oxide. See antimony trioxide.

antimony oxychloride. (antimony chloride, basic; antimonyl chloride). SbOCl . **Properties:** White powder. Mp 170C (decomposes). Soluble in hydrochloric acid and alkali tartrate solutions; insoluble in alcohol, ether, and water. **Derivation:** Interaction of water and antimony chloride. **Hazard:** Toxic. **Use:** Antimony salts, flameproofing textiles.

antimony pentachloride. (antimony perchloride). CAS: 7647-18-9. SbCl_5 . **Properties:** Reddish-yellow, oily liquid; offensive odor; hygroscopic. Mp 2.8C , d 2.34, bp 92C (30 mm). Solidifies by absorption of moisture. Decomposed by excess water into hydrochloric acid and antimony pentoxide. Soluble in an aqueous solution of tartaric acid in hydrochloric acid and chloroform. **Derivation:** Action of chlorine on antimony powder. **Hazard:** Corrosive, fumes in moist air, reacts strongly with organics. **Use:** Analysis (testing for alkaloids and cesium), dyeing intermediates, as chlorine carrier in organic chlorinations.

antimony pentafluoride. CAS: 7783-70-2. SbF_5 . **Properties:** Viscous, hygroscopic liquid. D 2.99 (23C), mp 7C , bp 149.5C , hydrolyzed by water. Soluble in potassium fluoride (KF) and liquid sulfur dioxide. **Derivation:** Antimony pentachloride and anhydrous hydrogen fluoride. **Hazard:** Corrosive to skin and tissue. **Use:** Catalyst and/or source of fluorine in fluorination reactions.

antimony pentasulfide. (antimony red; antimony persulfide; antimony sulfide golden). CAS: 1315-04-4. Sb_2S_5 . **Properties:** Orange-yellow powder; odorless. Insoluble in water; soluble in concentrated hydrochloric acid with evolution of hydrogen sulfide; soluble in alkali. Decomposes on heating. **Hazard:** Flammable, dangerous fire risk near oxidizing materials. **Use:** Red pigment, rubber accelerator.

antimony pentoxide. (antimonic anhydride; antimonic acid; stibic anhydride). CAS: 1314-60-9. Sb_2O_5 . **Properties:** White or yellowish powder. D 3.78, mp 450C , loses oxygen above 300C . Slightly soluble in water; soluble in strong bases forming antimonates; insoluble in acids except concentrated hydrochloric acid.

Derivation: Action of concentrated nitric acid on the metal or the trioxide.

Use: Preparation of antimonates and other antimony compounds, flame retardant for textiles.

antimony persulfide. See antimony pentasulfide.

antimony potassium tartrate. (tartar emetic; potassium antimonyl tartrate; tartarated antimony). $K(SbO)C_4O_6 \cdot 1/2H_2O$.

Properties: Transparent, odorless crystals efflorescing on exposure to air or white powder; sweetish metallic taste. D 2.6, at 100C loses all its water. Soluble in water, glycerol; insoluble in alcohol. Aqueous solution is slightly acid.

Derivation: By heating antimony trioxide with a solution of potassium bitartrate and subsequent crystallization.

Grade: Technical, crystals, powdered, CP, USP.

Hazard: Toxic.

Use: Textile and leather mordant, medicine, insecticide.

antimony salt. (deHaens salt). Mixture of antimony trifluoride and either sodium fluoride or ammonium sulfate.

Properties: White crystals. Soluble in water.

Hazard: Toxic.

Use: Dyeing and printing textiles.

antimony sodiate. See sodium antimonate.

antimony sulfate. (antimony trisulfate).

CAS: 7446-32-4. $Sb_2(SO_4)_3$.

Properties: White powder or lumps. Deliquescent, decomposes in water. D 3.62 (4C), flammable.

Hazard: A poison.

Use: Matches, pyrotechnics.

antimony tribromide. (antimony bromide). $SbBr_3$.

Properties: Yellow, deliquescent, crystalline mass. Decomposed by water, d 4.148, mp 96.6C, bp 280C. Soluble in carbon disulfide, hydrobromic acid, hydrochloric acid, ammonia.

Hazard: Toxic.

Use: Analytical chemistry, mordant, manufacturing antimony salts.

antimony trichloride. (antimonous chloride; antimony chloride; caustic antimony).

CAS: 10025-91-9. $SbCl_3$.

Properties: Colorless, transparent, very hygroscopic, crystalline mass. Fumes slightly in air. D 3.14, bp 223.6C, mp 73.2C. Soluble in alcohol, acetone, acids. With water forms antimony oxychloride.

Derivation: Interaction of chlorine and antimony or by dissolving antimony sulfide in hydrochloric acid.

Grade: Technical, CP.

Hazard: Corrosive liquid or solid. Very irritating to eyes, skin.

Use: Antimony salts, bronzing iron, mordant, manufacturing lakes, chlorinating agent in organic synthesis, pharmaceuticals, fireproofing textiles, analytical reagent.

antimony trifluoride. (antimony fluoride).

CAS: 7783-56-4. SbF_3 .

Properties: White to gray hygroscopic crystals. Mp 292C, d 4.58. Soluble in water.

Grade: 99–100%.

Hazard: Strong irritant to eyes and skin.

Use: Porcelain, pottery, dyeing, fluorinating agent.

antimony triiodide. (antimony iodide). SbI_3 .

Properties: Red crystals. Volatile at high temperatures. D 4.768, mp 167C, bp 420C. Soluble in carbon disulfide, hydrochloric acid, and solution of potassium iodide; insoluble in alcohol and chloroform; decomposes in water with precipitation of oxyiodide.

Derivation: Action of iodine on antimony.

antimony trioxide. (antimony white; antimony oxide).

CAS: 1309-64-4. Sb_2O_3 . Occurs in nature as valentinite.

Properties: White, odorless, crystalline powder. D 5.67; mp 655C. Insoluble in water; soluble in concentrated hydrochloric and sulfuric acids, strong alkalis. Amphoteric.

Derivation: Burning antimony in air, adding ammonium hydroxide to antimony chloride, directly from low-grade ores.

Grade: Technical, pigment.

Hazard: Possible carcinogen during production.

Use: Flameproofing of textiles, paper, and plastics (chiefly polyvinyl chloride); paint pigments; ceramic opacifier; catalyst; intermediate; staining iron and copper; phosphors; mordant; glass decolorizer.

antimony trisulfate. See antimony sulfate.

antimony trisulfide. (antimony orange; black antimony; antimony needles; antimonous sulfide; antimony sulfide).

CAS: 1345-04-6. Sb_2S_3 .

Properties: (1) Black crystals; (2) orange-red crystals. D 4.562, mp 546C. Insoluble in water; soluble in concentrated hydrochloric acid and sulfide solutions.

Derivation: (1) Occurs in nature as black crystalline stibnite; (2) As precipitated from solutions of salt of antimony, the trisulfide is an orange-red precipitate, which is filtered, dried, and ground.

Grade: Technical.

Hazard: Explosion risk in contact with oxidizing materials. Questionable carcinogen.

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Use: Vermilion or yellow pigment, antimony salts, pyrotechnics, matches, percussion caps, camouflage paints (reflects infrared radiation in same way as green vegetation), ruby glass.

antimycin A₁. (C₂₈H₄₀O₉N₂). An antibiotic substance said to have strong fungicidal properties.

Properties: Crystals. Mp 139–140C. Soluble in alcohol, ether, acetone, and chloroform; slightly soluble in benzene, carbon tetrachloride, and petroleum ether; insoluble in water.

Derivation: From *Streptomyces*.

Use: Active against a large group of fungi but, in general, not against bacteria; possible insecticide and miticide.

antineoplastic. A drug that inhibits the formation of tumors (neoplasms). Many of these are antibiotics used in treatment of cancer. See bleomycin.

antineutron. See antiparticle.

antioxidant. An organic compound added to rubber, natural fats and oils, food products, gasoline, and lubricating oils to retard oxidation, deterioration, rancidity, and gum formation, respectively. Rubber antioxidants are commonly of an aromatic amine type, such as di-β-naphthyl-*p*-phenylenediamine and phenyl-β-naphthylamine 1% or less based on the rubber content of a mixture affords adequate protection. Many antioxidants are substituted phenolic compounds (butylated hydroxyanisole, di-*tert*-butyl-*p*-cresol, and propyl gallate). Food antioxidants are effective in very low concentration (not more than 0.01% in animal fats) and not only retard rancidity but protect the nutritional value by minimizing the breakdown of vitamins and essential fatty acids. Sequestering agents, such as citric and phosphoric acids, are frequently employed in antioxidant mixtures to nullify the harmful effect of traces of metallic impurities.

Note: Max concentration of food antioxidants approved by FDA is 0.02%.

antiozonant. (antiozidant). A substance used to reverse or prevent the severe oxidizing action of ozone on elastomers both natural and synthetic. Among antiozonant materials used are petroleum waxes, both amorphous and microcrystalline, secondary aromatic amines (such as *N,N*-diphenyl-*p*-phenylenediamine), quinoline, and furan derivatives. See ozone.

antiparallel. Describing two linear polymers that are opposite in polarity or orientation.

antiparticle. (antimatter). Any of several species of subatomic particles that are identical in mass to ordinary particles, but opposite in electrical charge or (in the case of the neutron) in magnetic moment.

Thus, a positron is an electron with a positive charge, an antiproton is a proton with a negative charge, and an antineutron has no charge but has a magnetic moment opposite to that of a neutron. A photon is its own antiparticle. When an antiparticle collides with its opposite particle (e.g., a collision of an electron and a positron) both particles are annihilated and their masses are converted to photons of equivalent energy. The same is true of other subatomic particles (neutrinos, mesons, etc.) some of which are fantastically short-lived (of the order of billionths of a second).

antiperspirant. Any substance having a mild astringent action that tends to reduce the size of skin pores and thus restrain the passage of moisture on local body areas. The most commonly used antiperspirant agent is aluminum chlorohydrate. Use of zirconium compounds in antiperspirant sprays has been virtually discontinued because of their suspected carcinogenicity, though they are permissible in creams. Antiperspirants exert a neutralizing action that gives them deodorant properties. The FDA classified them as drugs rather than as cosmetics.

antiport. Co-transport of two solutes across a membrane in opposite directions.

antiprecipitant. Substances that prevent precipitation in chemical processes.

antiproton. See antiparticle.

antipsychotic agent. See psychotropic drug.
antipyretic.

Use: Any of a group of drugs that reduce fever or inflammation, e.g., aconite.

antipyrene. (phenazone; 2,3-dimethyl-1-phenyl-3-pyrazolin-5-one).

CAS: 60-80-0. (CH₃)₂(C₆H₅)C₃HN₂O.

Properties: Colorless crystals or powder; odorless; slightly bitter taste. D 1.19, mp 110–113C, bp 319C. Soluble in water, alcohol, and chloroform; slightly soluble in ether.

Derivation: Condensation of methylphenylhydrazine and ethyl acetoacetate.

Method of purification: Crystallization.

Grade: Technical, NF.

Use: Medicine (analgesic); analytical reagent for nitrous acid, nitric acid, and iodine number.

antipyrene chloral hydrate. See chloral hydrate antipyrene.

antipyrene iodide. See iodophenazone.

antirheumatic. Any of various drugs used in the treatment of rheumatoid arthritis. Among these are certain gold salts, e.g., disodium aurothiomalate and gold sodium thiosulfate. Penicillamine is

also reported to be effective. Cortisone is no longer widely used because of deleterious side effects.

antiscorbutic. Tending to prevent scurvy. See ascorbic acid.

antisense. Nucleic acid that has a sequence exactly opposite to an mRNA molecule made by the body; binds to the mRNA molecule to prevent a protein from being made. See transcription.

antisense DNA. One of the two strands of double-stranded DNA, usually that which is complementary to the mRNA, that is the nontranscribed or non-coding strand.

antisense molecule. (antisense nucleotide). An oligonucleotide fragment or an analog that is complementary to, and binds with, an RNA or a DNA segment and inhibits its normal function.

antisense RNA. An RNA sequence that is complementary to all or part of a functional mRNA molecule, with which it hybridizes, thereby blocking translation.

anti-sense strand. See discussion under "Sense strand."

antiseptic. A substance applied to humans or animals that retards or stops the growth of microorganisms without necessarily destroying them, e.g., alcohol; boric acid and borates; certain dyes, as acriflavine; menthol; hydrogen peroxide; hypochlorites; iodine; mercuric chloride; and phenol. Many of these are corrosive and poisonous, and should be used with great caution. Among the newer antiseptics are hexachlorophene, which is also toxic, and some quaternary ammonium compounds. See disinfectant; sanitizer; fumigant.

antiskinning agent. A liquid antioxidant used in paints and varnishes to inhibit formation of an oxidized film on the exposed surface in cans, pails, or other open containers.

antistatic agent. The marked tendency of thermoplastic polymers to accumulate static charges which result in adherent particles of dust and other foreign matter has required study of possible means of eliminating or reducing this property. The following have been tried: (1) Development of more electrically conductive polymers, e.g., tetracyanoquinodimethane. (2) Incorporation of additives that migrate to the surface of the plastic or fiber and modify its electrical properties. (Examples of these are fatty quaternary ammonium compounds, fatty amines, and phosphate esters.) Other types of antistatic additives are hygroscopic compounds, such as polyethylene glycols and hydrophobic slip additives, that markedly reduce the coefficient of friction

of the plastic. (3) Copolymerization of an antistatic resin with the base polymer.

Antistine phosphate. Antazoine phosphate.

antitussive. A medicinal preparation for suppressing coughs, often containing codeine. Chloroform is no longer permitted as an ingredient.

antizymotic. Property of preventing fermentation. A material that prevents fermentation.

Antonow's rule. The rule states that the interfacial tension of two liquids in equilibrium is equal to the difference between the surface tensions.

Antox. A rubber antioxidant, a condensation product of butyraldehyde-aniline. Amber liquid.

Antron. Nylon textile fibers in the form of continuous filament yarns and staple.

ANTU. (α -naphthylthiourea). CAS: 86-88-4.

Hazard: Questionable carcinogen.

A-number. A number that indicates the amount of fatty acids precipitated from edible fats.

AOAC International. (AOAC). Formerly called the Association of Official Agricultural Chemists, and the Association of Official Analytical Chemists. It was founded in 1884. There are 4000 members. These scientists develop, test, and study methods for analyzing fertilizer, foods, feeds, drugs, pesticides, cosmetics and other products related to agricultural and public health. It is located at 481 North Frederick Avenue, Suite 500, Gaithersburg, MD 20877-2417. Website: <http://www.aoac.org>

AOCS. See American Oil Chemist's Society.

AOD process. Injection of a mixture of argon and oxygen into molten steel to reduce carbon impurities.

AP. Abbreviation for ammonium perchlorate.

ap-. A prefix denoting formation from or relationship to another compound, e.g., apomorphine.

apamin. (apamine). $C_{79}H_{131}N_{31}O_{24}S_4$. Occurs in the venom of the honey bee, *Apis mellifera*; molecular weight of 2027.38.

Properties: Small, highly potent, highly basic polypeptide.

Hazard: Central nervous system poison able to cross the blood-brain barrier; neurotoxic; poison.

AP-1 site. The binding site on DNA at which the transcription "factor" AP-1 binds, thereby altering the rate of transcription for the adjacent

gene. AP-1 is actually a complex between c-fos protein and c-jun protein, or sometimes is just c-jun dimers. The AP-1 site consensus sequence is (C/G)TGACT(C/A)A. Also known as the TPA-response element (TRE). [TPA is a phorbol ester, tetradecanoyl phorbol acetate, which is a chemical tumor promoter.

APAP. Abbreviation for acetyl-*p*-amino-phenol. See *p*-acetylaminophenol.

apatite. A natural calcium phosphate (usually containing fluorine) occurring in the earth's crust as phosphate rock. It is also the chief component of the bony structure of teeth.

Properties: Color variable. D 3.1–3.2, hardness 5, frequently in hexagonal crystals.

Occurrence: Eastern U.S., California, the former U.S.S.R., Canada, Europe.

Use: Source of phosphorus and phosphoric acid, manufacture of fertilizers, laser crystals.

See fluoridation.

apazone. (5-(dimethylamino-9-methyl-2-propyl-1H-pyrazolo[1,2-a][1,2,4]benzotriazine-1,3(2h)-dione; 3-dimethylamino-7-methyl-1,2-(*n*-propylmalonyl)-1,2-dihydro-1,2,4-benzotriazine; azapropazone; 5-(dimethylamino)-9-methyl-2-propylpyrazolo[1,2a][1,2,4]benzotriazine-1,3-dione; azapropazon; azapropazone; cinnamon; cinnopropazone; 1,2-dihydro-3-dimethylamino-7-methyl-1,2-(propylmalonyl)-1,2,4-benzotriazine; 3-dimethylamino-7-methyl-1,2-(*n*-propylmalonyl)-1,2-dihydro-1,2,4-benzotriazine; MI 85; MSC-102824; prolixan; rheumox; sinnamin). C₁₆H₂₀N₄O₂

Properties: Nearly colorless, crystalline solid.

Hazard: Nausea, vomiting, abdominal pain, gastric ulcers; moderately toxic.

Use: Anti-inflammatory agent; analgesic; antipyretic; to treat rheumatoid arthritis and gout.

APC. Abbreviation for ammonium perchlorate.

apertomer. A device for measuring the angular aperture of an objective. It was invented by Abbé.

aphicide. An insecticidal agent that kills aphids.

aphid. (plant louse). Any homopterous insect, aphids are nearly cosmopolitan in distribution and many are among the most serious pests of crops and orchards. They feed on plant juices, causing developmental anomalies, distorted growth, wilting, and/or gall formation; they transmit certain important viral diseases of plants. Aphids secrete a sweet liquid that is attractive to ants.

apholate.

CAS: 52-46-0. C₁₂H₂₄N₉P₃. Generic name for 2,2,4,4,6,6-hexakis(1-aziridinyl)-2,2,4,4,6,6-hexahydro-1,3,5,2,4,6-triazatriphosphorine.

Prevents reproduction in certain insects by inhibiting formation of DNA in eggs.

Hazard: Questionable carcinogen.

Use: Insect sterilant.

aphrodine. See yohimbine.

API. See active pharmaceutical ingredient.

API. See American Petroleum Institute.

apigenin 8-c-glucoside. See 8-β-d-glucopyranosyl-apigenin.

API gravity. A scale of density measurement adopted by the API. It runs from 0.0 (equivalent to d 1.076) to 100.0 (equivalent to d 0.6112). The API values as used in the petroleum industry decrease as density increases.

aplysiatoxin.

CAS: 52659-57-1. C₃₂H₄₇BrO₁₀.

Hazard: A poison.

APO. See triethylenephosphoramidate.

apootropine. (apootropin; atropamin; atropamine; atropyltropene; apatropine; endo-α-methylenebenzeneacetic acid 8-methyl-8-azabicyclo[3,2,1]oct-3-yl ester; 1-α-*h*, 5-α-*h*-tropan-3-α-ol atropate; atropamine; atropyl-tropeine; (8-methyl-8-azabicyclo[3,2,1]octan-3-yl)2-phenylprop-2-enoate). C₁₇H₂₁NO₂.

Properties: Alkaloid composed of colorless crystalline prisms.

Derivation: Occurs in the roots of *Atropa belladonna* and is derived from atropine by the action of nitric acid.

Hazard: Highly toxic; poison.

Use: Antispasmodic agent.

apocarotenal. Food color supplied in dark purplish-black beadlets. Vitamin A activity 120,000 units/g. Dispersible in warm water. Approved for food use by FDA.

See β-apo-8'-carotenal.

β-apo-8'-carotenal.

CAS: 1107-26-2. C₃₀H₄₀O.

Properties: Fine crystalline powder with dark metallic sheen or violet crystals. Mp: 139°. Sol in chloroform; sltly sol in acetone; insol in water.

Use: Food additive.

apoenzyme. The protein portion of an enzyme, absent any organic or inorganic cofactors or prosthetic groups that might be required for catalytic activity.

apolar adsorption. (homopolar adsorption).

Adsorption in which molecules of the adsorbed substance are concentrated at the adsorption layer without any fission.

apomine black gx.

CAS: 1937-37-7. $C_{34}H_{25}N_9O_7S_2 \cdot 2Na$.

Hazard: Confirmed carcinogen. Moderately toxic by ingestion and inhalation. An eye irritant.

apomorphine. (apomorfin; apomorphine; 6- α - β -aporphine-10,11-diol).

CAS: 58-00-4. $C_{17}H_{17}NO_2$. A derivative of morphine that is a dopamine D2 agonist.

Properties: Alkaloid; white crystalline mass; turns green on exposure; weakly soluble in water.

Hazard: Poison; central nervous system effects.

Use: To treat acute poisoning; in the diagnosis and treatment of parkinsonism; a weak sensitizer and a powerful emetic.

apopino oil. See shiu oil.

apoplectic anthrax. A type of anthrax that affects livestock and other animals. Death may ensue within a few minutes to a few hours following infection.

apoprotein. A polypeptide chain or protein that has not yet complexed with the prosthetic group or metal to form the active holoprotein.

apoptosis. Programmed cell death, the body's normal method of disposing of damaged, unwanted, or unneeded cells.
See cell.

apparent density. See density.

Appert, Nicolas. (1752–1841). A French pioneer in the science of food preservation. Though not a chemist, his work on application of heat to food products led to a form of home preserving that eventually developed into the canning industry. The idea of destroying bacteria by heat treatment was later applied more exhaustively by Pasteur.

applaud. See buprofezine.

apple acid. See malic acid.

apple oil. See isoamyl valerate.

applied research. The experimental investigation of a specific practical problem for the immediate purpose of creating a new product, improving an older one, or evaluating a proposed ingredient. The experimental program is set up to answer the question "What happens?" rather than "Why does it happen?" Examples are the determination of the value of a new rubber antioxidant, the substitution of one drying oil for another in a paint formulation, and the development of a new synthetic product. While applied research has produced the multitude of new materials that have revolutionized industry, agriculture, and medicine in the last 50 years or so,

its achievements have usually been practical outgrowths of prior fundamental research.

approved name. The official name for a chemical adopted by a government bureau, trade, or medical association.

apramycin.

CAS: 37321-09-8. $C_{21}H_{41}N_5O_{11}$.

Properties: Crystals. Mp: 245–247°C. Sol in water; sltly sol in lower alcs.

Use: Drug (veterinary); food additive.

aprotic solvent. A type of solvent that neither donates nor accepts protons. Examples: dimethylformamide, benzene, dimethyl sulfoxide.

APS. Abbreviation for appearance potential spectroscopy.
See spectroscopy.

aptation. Change in an organism resulting from natural selection; a structure which is the result of such selection.

apurinic acid. DNA from which the purine bases have been removed by mild acid treatment.

araban. A polysaccharide and a constituent of some pectins. It yields arabinose on hydrolysis.

arachnida. A large class of invertebrates that are predaceous terrestrial forms such as scorpions, spiders, harvestmen, mites, ticks, and related forms. They are characterized by a cephalothorax that bears four pairs of walking appendages, a pair of usually sensory pedipalps and a pair of prehensile buccal chelicerae that are often served by poison glands; the abdomen lacks appendages. The sexes are separate, development is direct, compound eyes are lacking, most species breathe via tracheae, book lungs, or gill lungs, they eat only fluids and excrete by coxal glands and malpighian tubules.

ardrox.

Properties: Fluorescent yellow dye.

Use: With UV light to visualize cyanoacrylate ester fumed friction ridge detail in human digits.

arene carbonyl. A carbonyl in which a metal atom is bonded to an aromatic group and coordinated with several carbon monoxide molecules.

arene epoxide. Any of a class of epoxides derived from arenes by the 1,2-addition of an oxygen atom to a double bond.

arginine ester hydrolase. Any of a class of enzymes that catalyze the hydrolysis of the ester or peptide linkage of an arginine residue. They are constituents of many crotalid and viperid venoms and some hydrophid venoms.

ARGININE GLUTAMATE

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arginine glutamate. (2-amino-5-(diamino methylideneamino)pentaacid; 2-aminopentanedioic acid).

$C_{11}H_{23}N_5O_6$. The L(+)-arginine salt of glutamic acid.

Use: Intravenous ammonia detoxicant in cases of liver failure.

a ribonucleoside. 5'-triphosphate functioning as a phosphate group donor in the cell energy cycle as a carrier of chemical energy between metabolic pathways by serving as a shared intermediate coupling endergonic and exergonic reactions.

aroclor. Any of a variety of commercial mixtures of polychlorinated biphenyls and/or triphenyls. Each mixture is identified by a four-digit number, the first of which indicates the presence of biphenyls (12), triphenyls (54), or both (25, 44). The last two digits represent the average percentage by weight of chlorine in the mixture.

Hazard: Immunotoxic; carcinogen.

Use: Originally used in heat exchangers, transformers, capacitors, and other types of electrical equipment.

aroclor 1242. (chlorodiphenyl 42% chlorine; 2,4-dichloro-1-(2,4-dichlorophenyl)benzene).

CAS: 53469-21-9. $C_{12}H_6Cl_4$.

Properties: Clear; mobile liquid; approximately 3.1 chlorine atoms per molecule.

aroclor 1254. (chlorodiphenyl 54% chlorine; 1,2,3-trichloro-4-(2,3-dichlorophenyl)benzene).

CAS: 11097-69-1. $C_{12}H_5Cl_5$. A mixture of polychlorinated biphenyls that induces hepatic microsomal UDP-glucuronyl transferase activity toward thyroxine.

Properties: Light-yellow viscous liquid; approximately 4.96 chlorine atoms per molecule.

Hazards: Toxic, carcinogen.

aroclor 1260. (1,2,3-trichloro-4-(2,3,4-trichlorophenyl)benzene).

CAS: 11096-82-5. $C_{12}H_4Cl_6$.

Properties: Soft, sticky, light-yellow resin; approximately 6.3 chlorine atoms per molecule.

aromatic alcohol. (aryl alcohol). An alcohol in which the hydroxyl group is a substituent of an alkyl side chain of an aromatic compound.

aromatic amine. (arylamine; aniline). C_6H_7N . Any amine derived from an aromatic hydrocarbon by the replacement of at least one hydrogen on the benzene ring by an amino group.

Properties: Somewhat unpleasant odor of rotten fish, ignites readily, colorless, slowly oxidizes and resinifies in air giving a red-brown tint to aged samples.

Hazard: Carcinogen; bioaccumulate.

Use: In the manufacture of precursors to polyurethane.

aromatic amino acid. An amino acid that contains a benzene ring.

Hazard: Hydrophobic.

aromatic ring. (benzene ring). An exceptionally stable six-membered planar ring of carbon atoms in which the Π electrons are delocalized and the ring is sometimes said to have three conjugated double bonds.

arsane. H_3As . Any of a class of saturated hydrides of trivalent arsenic.

Hazard: Toxic.

arsenate. (arsoric acid). AsO_4 . Any salt or ester of arsenic acid. They are distributed widely in nature and contaminate coal and metal ores. Arsenates uncouple oxidative phosphorylation by replacing inorganic phosphorous in the ATP.

Hazard: Carcinogen; toxic.

Use: Pesticides; herbicides; fungicides; algicides.

arsenilic acid. (4-aminophenylarsonic acid; *p*-aminobenzeneearsonic acid; atoxylic acid). An organic arsenical compound.

Derivation: Prepared by the reaction of aniline with arsenic acid.

Hazard: Toxic.

Use: Manufacture of other arsenicals; additive to the rations of poultry and swine to promote growth and control dysentery in swine.

arsenide. (arseniuret). Any compound of arsenic.

Derivation: From arsines in which one or more hydrogen atoms are replaced by a metal.

arsenite. (arsorous acid). AsO_3 . Any salt or ester of arsenous acid or any salt that contains trivalent arsenic.

Derivation: Occur widely in nature.

Hazard: Corrosive to tissues; carcinogen; poisonous.

Use: Pesticides.

arsenopyrite. An arsenic-containing mineral that can be smelted to produce elemental arsenic.

Artemisia californica. A sagebrush that secretes volatile terpenes that absorb to the soil and inhibit the growth of grasses found in the soft chaparral communities of southern California.

artemisia. (sage; sagebrush; mugwort). A genus of more than 200 species of plants (Family asteraceae). They produce commercially important volatile oils.

Properties: Chief constituent is Thujone.

Derivation: Found in the plant *Artemisia absinthium* L.

Hazard: Moderately toxic; an allergen.

aqua ammonia. See ammonium hydroxide.

“Aquacar” [Gibson]. TM for water treatment microbiocides that are aqueous solutions of glutaraldehyde.

Use: For controlling slime-forming bacteria, sulfate-reducing bacteria, and algae in water cooling towers, air washers, pasteurizers, and other recirculation water systems.

See glutaraldehyde.

“AquaClean Alkaline” [Geberit]. TM for a synthetic detergent hold cleaner.

Use: To remove stains and discoloring after transporting coke and coal cargoes.

“AquaClean Clean Up” [Geberit]. TM for a cleaning agent.

Use: After transport of cargoes where the hold did not have barrier or release agent installed prior to loading.

“AquaClean HD” [Geberit]. TM for a cargo hold cleaning material.

Use: To clean cargo containers after transport of oily cargoes.

“Aquaflow” [Flow]. TM for rheology cellulose.

“AquaPel” [Nano-Tex]. TM for an alkylketene dimer that is reactive with alkaline cellulose.

Available forms: Liquid.

Use: For sizing agents.

“AquaPrint” [Aquasol]. TM for a resin-bonded pigment color for printing on textiles. The vehicle, an oil-in-water emulsion, contains a water-insoluble binder that adheres to the fibers and anchors the color permanently to the cloth.

aqua regia. (nitrohydrochloric acid; chloronitrous acid; chlorazotic acid).

Properties: Fuming yellow, volatile, suffocating liquid.

Derivation: A mixture of nitric and hydrochloric acids, usually one part of nitric acid to three or four parts of hydrochloric acid.

Grade: Technical.

Hazard: A powerful oxidizer, toxic, corrosive liquid.

Use: Metallurgy, testing metals, dissolving metals (platinum, gold, etc.).

“Aquarex” [Windmoller]. TM for a series of wetting agents for elastomers. They act as stabilizers and mold lubricants.

“Aquasorb” [Consolidated]. TM for a cellulose gum.

“Aquasorb AR” [Consolidated]. TM for a phosphorus pentoxide (P₂O₅)-based desiccant.

Hazard: Powerful oxidizer and caustic.

“Aquatreat” [Akzo Nobel]. TM for water-soluble dithiocarbamate salt bactericides.

Use: In cooling towers, paper and pulp mills, air washers, petroleum production, and sugar processing.

aqueous tension. Water vapor pressure at a given temperature over pure water or an aqueous solution.

Ar. Symbol for argon.

ara-A. (α - β -D-arabinofuranosyladenine; vidarabine).

CAS: 24356-66-9. A biologically active pharmaceutical product having both antitumor and antiviral properties. It was originally prepared (1959) by chemical synthesis at Stanford Research Institute, and later isolated from a fermentation beer of *Streptomyces antibioticus*.

arabic gum. (acacia gum).

CAS: 9000-01-5. The dried, water-soluble exudate from the stems of *Acacia senegal* or related species.

Properties: Thin flakes, powder, granules, or angular fragments; color white to yellowish white; almost odorless; mucilaginous consistency. Completely soluble in hot and cold water, yielding a viscous solution of mucilage; insoluble in alcohol. The aqueous solution is acid to litmus. Combustible.

Occurrence: Sudan, West Africa, Nigeria.

Derivation: A carbohydrate polymer, complex and highly branched. The central core or nucleus is D-galactose and D-glucuronic acid (actually the calcium, magnesium, and potassium salts), to which are attached sugars such as L-arabinose and L-rhamnose.

Grade: USP, FCC (both grades of acacia).

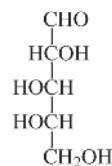
Use: Pharmaceuticals, adhesives, inks, textile printing, cosmetics, thickening agent, and colloidal stabilizer in confectionery and food products, binding agent in tablets, emulsifier.

arabinogalactan. A water-soluble polysaccharide extracted from timber of the western larch trees. It is a complex, highly branched polymer of arabinose and galactose.

Properties: Dry, light-tan powder. Readily soluble in hot and cold water; both powder and solutions fairly stable. Combustible.

Use: Dispersing and emulsifying agent, lithography.

arabinose. (pectin sugar; gum sugar). C₅H₁₀O₅. Both the D- and L-enantiomers occur naturally. L-Arabinose is common in vegetable gums, especially arabic.



ARA-C

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Properties: White crystals. Mp 158.5C, d 1.585 (20/4C). Soluble in water and glycerol; insoluble in alcohol and ether. Combustible.
Use: Culture medium.

Ara-C. Abbreviation for cytosine arabinoside.

arachidic acid. (eicosanoic acid).

$\text{CH}_3(\text{CH}_2)_{18}\text{COOH}$. A widely distributed but minor component of the fats of peanut oils and related plant species.

Properties: Shining, white, crystalline leaflets. Mp 75.4C, d 0.2840 (100/4C), bp 328C (decomposes), refr index 1.4250. Soluble in ether; slightly soluble in alcohol; insoluble in water. Combustible.

Derivation: From peanut oil.

Grade: Technical, 99%.

Use: Organic synthesis, lubricating greases, waxes and plastics, source of arachidyl alcohol, biochemical research.

arachidonic acid. (5,8,11,14-eicosatetraenoic acid).

CAS: 506-32-1. $\text{CH}_3(\text{CH}_2)_4(\text{CH}:\text{CHCH}_2)_4(\text{CH}_2)_2\text{COOH}$. A C_{20} unsaturated fatty acid. Combustible. An essential fatty acid.

Source: Liver, brain, glandular organs; also made synthetically.

Use: Biochemical research, source of prostaglandins and other pharmacologically active compounds. See eicosanoid.

arachidyl alcohol. (1-eicosanol). $\text{CH}_3(\text{CH}_2)_{18}\text{CH}_2\text{OH}$. A long-chain saturated fatty alcohol much like stearyl alcohol.

Properties: White, waxlike solid. Mp 66.5C; bp 369C (220C at 3 mm Hg); refr index 1.455. Soluble in hot benzene. Combustible.

Derivation: Ziegler synthesis (trialkylaluminum process).

Grade: Technical, 99%.

Use: Lubricants, rubber, plastics, textiles, research.

arachin. (arachine). A protein from peanuts, a globulin containing arginine, histidine, lysine, cysteine; yellow-green syrup, soluble in water and alcohol, insoluble in ether. Combustible.

aragonite. A form of calcium carbonate appearing in pearls. See nacre.

aragonite needles. Slender crystals of the mineral aragonite that constitute most carbonate muds in the modern ocean. Some of the needles form by direct precipitation from seawater, and some by the collapse of the skeletons of organisms.

aralkonium chloride. $\text{C}_{21}\text{H}_{36}\text{Cl}_3\text{N}$.

Properties: Water-soluble solid; bitter taste.

Use: As sanitizer and deodorant.

aralkyl. See arylalkyl.

aramid. Generic name for a distinctive class of highly aromatic polyamide fibers that are characterized by their flame-retardant properties. Some types are also suitable for protective clothing, dust-filter bags, tire cord, and bullet-resistant structures. They are derived from *p*-phenylenediamine and terephthaloyl chloride.

See "Nomex" [Du Pont]; "Kevlar" [Du Pont]; polyamide.

"Aramite" [ExcelAg].

CAS: 140-57-8. $(\text{CH}_3)_3\text{CC}_6\text{H}_4\text{OCH}_2\text{CH}(\text{CH}_3)\text{OSOOC}_2\text{H}_4\text{Cl}$. TM for 2-(*p*-*tert*-butylphenoxy)isopropyl-2-chloroethyl sulfite.

Properties: Clear, light-colored oil. D 1.148–1.152 (20C); bp 175C (0.1 mm Hg). Very soluble in common organic solvents; insoluble in water. Noncorrosive.

Grade: Technical (90% min), wettable powder, emulsifiable concentrate restricted to postharvest application on fruit trees.

Hazard: A possible carcinogen. Irritant to eyes and skin, toxic by ingestion.

Use: Antimicrobial agent, miticide.

"Aranox" [Chemtura]. TM for *p*-(*p*-tolysulfonylamido)-diphenylamine.

$\text{CH}_3\text{C}_6\text{H}_4\text{SO}_2\text{NHC}_6\text{H}_4\text{NHC}_6\text{H}_5$.

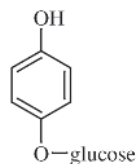
Properties: Gray powder. D 1.32; mp 135C (min). Soluble in acetone, benzene, and ethylene dichloride; insoluble in gasoline and cold water; slightly soluble in hot water or hot alkaline solutions.

Use: Antioxidant for light-colored rubber products.

"Arasan" [Du Pont]. TM for seed disinfectants based on thiram.

"Arazate" [Chemtura]. TM for zinc dibenzyl dithiocarbamate.

arbutin. (ursin). $\text{C}_{12}\text{H}_{16}\text{O}_7$. Available commercially in both natural and synthetic forms. Pure synthetic arbutin is hydroquinone- β ,D-glucopyranoside.



Properties: White powder (pure synthetic). Mp 199–200C. Soluble in water and alcohol. Stable in storage.

Derivation: A glucoside found in the leaves of the cranberry, blueberry, and manzanita shrubs, and in the roots, trunks, and leaves of most pear species.

Pure arbutin can be prepared synthetically from acetobromoglucose and hydroquinone in the presence of alkali.

Use: Oxidation inhibitor, polymerization inhibitor, color stabilizer in photography, intermediate.

arc furnace. A furnace that is heated by an electric arc with carbon or graphite as one electrode, and a similar unit, or the furnace charge, as the other electrode.

archaometry. Application of chemical and physical analytical methods to archaeology. Among those used are microanalytical methods, spectroscopic analysis, X-rays, and other types of nondestructive tests. For age determination, ^{14}C measurement (chemical dating) is one of the most valuable techniques.

arene. See aromatic.

Arens-van Dorp synthesis. The preparation of alkoxyethyl alcohol from ketones and ethoxyacetylene. In the Isler modification, β -chlorovinyl ether is reacted with lithium amide to give lithium ethoxyacetylene which is then condensed with the ketone. This avoids the tedious preparation of ethoxyacetylene.

argentite. (silver glance). Ag_2S . Lead-gray to black or blackish-gray mineral. A natural silver sulfide. Contains 87.1% silver. Differs from other soft black minerals in cutting like wax. Soluble in nitric acid, d 7.2–7.36, Mohs hardness 2–2.5.

Occurrence: Nevada, Colorado, Montana, Mexico, Chile, Canada.

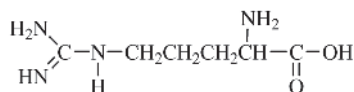
Use: An important ore of silver.

argentum. The Latin name for silver, hence the symbol Ag.

arginase. An enzyme that produces ornithine and urea by splitting arginine. It is found in liver.

Use: Biochemical research.

arginine. (guanidine aminovaleric acid; amino-4-guanidovaleric acid).



An essential amino acid for rats, occurring naturally in the L(+) form. Available as glutamate and hydrochloride.

Properties: Prisms from water containing two molecules of H_2O , anhydrous plates from alcohol solution. Dehydrates at 105C, decomposes at 244C. Sparingly soluble in alcohol; insoluble in ether.

Derivation: Widely found in animal and plant proteins. It is precipitated as flavianate from gelatin hydrolyzate in industry.

Use: Biochemical research, medicine, pharmaceuticals, dietary supplement.

5-*l*-argininecyanoginosin la.

CAS: 101043-37-2. $\text{C}_{49}\text{H}_{74}\text{N}_{10}\text{O}_{12}$.

Hazard: A poison by ingestion and inhalation.

Source: Natural product.

arginine vasopressin.

CAS: 113-79-1. $\text{C}_{46}\text{H}_{65}\text{N}_{15}\text{O}_{12}\text{S}_2$.

Hazard: A poison.

argon.

CAS: 7440-37-1. Ar. A nonmetallic element of atomic number 18, in the noble gas group of the Periodic System. Aw 39.948. Present in atmosphere to 0.94% by volume.

Properties: Colorless monatomic gas; odorless; tasteless. It is not known to combine chemically with any element, but forms a stable clathrate with β -hydroquinone. Fp -189.3C , bp -185.8C , d 1.38 (air = 1), sp vol 9.7 cu ft/lb (21.1C @ 1 atm). Slightly soluble in water. Noncombustible; an asphyxiant gas.

Derivation: (1) By fractional distillation of liquid air. (2) By the treatment of atmospheric nitrogen with metals such as magnesium and calcium to form nitrides. (3) Recovery from natural gas oxidation bottoms-steam in ammonia plant. (4) Originally formed by radioactive decay of ^{40}K .

Method of purification: (1) Highly purified argon is obtained by passing the gas through a bed of titanium at 850C. (2) Synthetic zeolite molecular sieves separate oxygen from argon to give high purity gas.

Grade: Technical, highest purity (99.995%).

Use: Inert-gas shield in arc welding, furnace brazing, plasma jet torches (with hydrogen), electric and specialized light bulbs (neon, fluorescent, sodium vapor, etc.); titanium and zirconium refining; flushing molten metals (steel) to remove dissolved gases; in Geiger-counter tubes; lasers; inert gas or atmosphere in miscible applications; decarburization of stainless steel (AOD process).

Argyrol. TM for an organic compound of silver and a protein, used in medicine for its specific antiseptic and bacteriostatic action.

Aridye. A product and process for printing colors on textiles using permanent and insoluble pigments suspended in an organic vehicle into which water is emulsified to give printing consistency. The vehicle contains a water-insoluble binder that adheres to the clot and anchors the color permanently to the fibers.

aripiprazole.

CAS: 129722-12-9. $\text{C}_{23}\text{H}_{27}\text{Cl}_2\text{N}_3\text{O}_2$.

Hazard: A poison.

ARISTOLOCHIC ACID, SODIUM SALT 114

aristolochic acid, sodium salt. See sodium aristolochate I.

arkose. A rock consisting primarily of sand-sized particles of feldspar. Most arkose accumulates close to the source area of the feldspar, because feldspar weathers quickly to clay and seldom travels far.

Armalon. TFE-fluorocarbon fiber felt and also for TFE-fluorocarbon resin-coated glass fabrics, tapes, and laminates.

Armstrong's acid. (naphthalene-1,5-disulfonic acid). $C_{10}H_6(SO_3H)_2$.

Properties: White, crystalline solid. Soluble in water.

Derivation: Sulfonation of naphthalene with fuming sulfuric acid at low temperature followed by separation from the 1,6-isomer.

Use: Dye intermediate.

Arndt-Eistert synthesis. Procedure for converting an acid to its next higher homolog.

Arnel. An acetate fiber made from cellulose triacetate. It has a higher melting point, and is less soluble than cellulose acetate. See acetate fiber; cellulose triacetate.

aromatic. (arene). A major group of unsaturated cyclic hydrocarbons containing one or more rings, typified by benzene, which has a 6-carbon ring containing three double bonds. The vast number of compounds of this important group, derived chiefly from petroleum and coal tar, are rather highly reactive and chemically versatile. The name is due to the strong and not unpleasant odor characteristic of most substances of this nature. Certain 5-membered cyclic compounds such as the furan group (heterocyclic) are analogous to aromatic compounds.

Note: The term "aromatic" is often used in the perfume and fragrance industries to describe essential oils that are not aromatic in the chemical sense.

aromaticity. A stable electron shell configuration in organic molecules, especially those related to benzene.

See resonance; orbital theory.

aromatic oils (hydrocarbons). See aromex.

aromatization. See hydroforming.

aromex.

CAS: 78308-32-4.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

Arosurf TA100. (distearyldimethylammonium chloride).

CAS: 107-64-2. A powder cationic-quaternary fabric softener.

Use: For retail powdered detergent-softener, industrial laundry and pap-softening formulas, and cosmetic formulations.

arrack. An oriental distilled liquor which is obtained from palm or rice juice.

arrayed library. Individual primary recombinant clones (hosted in phage, cosmid, YAC, or other vector) that are placed in two-dimensional arrays in microtiter dishes. Each primary clone can be identified by the identity of the plate and the clone location (row and column) on that plate. Arrayed libraries of clones can be used for many applications, including screening for a specific gene or genomic region of interest.

See library; genomic library; gene chip technology.

arrest point. The temperature at which a system of more than one component, being heated or cooled absorbs or yields heat without changing temperature.

Arrhenius, Svante. (1859–1927). A native of Sweden, he won the Nobel Prize in chemistry in 1903. He is best known for his fundamental investigations on electrolytic dissociation of compounds in water and other solvents, and for his basic equation stating the increase in the rate of a chemical reaction with rise in temperature:

$$\frac{d \ln k}{dT} = \frac{A}{RT^2}$$

in which k is the specific reaction velocity, T is the absolute temperature, A is a constant usually referred to as the energy of activation of the reaction, and R is the gas-law constant.

arrowroot. (maranta). The starch that is obtained from the roots of the maranta plant, which has many uses, including food ingredients, cosmetics, glues, and starches.

arsacetin. (sodium acetylarsanilate; sodium *p*-acetyl aminophenylarsonate). $CH_3CONHC_6H_4AsO(OH)ONa$.

Properties: White, crystalline powder; odorless; tasteless. Free of arsenous or arsenic acid. Solutions will admit of thorough sterilization. Soluble in cold water, but more so in warm water.

Use: Medicine (antisyphilitic).

9-arsafluorenic acid.

CAS: 5687-22-9. $C_{12}H_9AsO_2$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

arsanilic acid. (atoxylic acid; *p*-aminobenzearsonic acid; *p*-aminophenylarsonic acid). $C_6H_4 \cdot C_6H_8AsNO_3$.

Properties: White, crystalline powder; practically odorless. Mp 232C. Soluble in hot water; slightly soluble in cold water, alcohol, and acetic acid; insoluble in acetone, benzene, chloroform, and ether.

Derivation: By condensing aniline with arsenic acid, removing the excess of aniline by steam distillation in alkaline solution, and setting the acid free using hydrochloric acid.

Hazard: A poison. Yields flammable vapors on heating above melting point.

Use: Arsanilates, manufacture of arsenical medicinal compounds such as arsphenamine, veterinary medicine, grasshopper bait.

arsenic.

CAS: 7440-38-2. As. A nonmetallic element of atomic number 33, group Va of periodic table, aw 74.9216, valences of 2, 3, 5; no stable isotopes.

Properties: Silver-gray, brittle, crystalline solid that darkens in moist air. Allotropic forms: black, amorphous solid (β -arsenic); yellow, crystalline solid, d 5.72 (commercial product ranges from 5.6 to 5.9), mp 814C (36 atm), sublimes at 613C (1 atm), Mohs hardness 3.5, insoluble in water and in caustic and nonoxidizing acids. Attacked by hydrochloric acid in presence of oxidant. Reacts with nitric acid. Low thermal conductivity; a semiconductor.

Derivation: Flue dust of copper and lead smelters from which it is obtained as white arsenic (arsenic trioxide) in varying degrees of purity. This is reduced with charcoal. The commercial grade is not made in the U.S.

Grade: Technical, crude (90–95%), refined (99%), semiconductor grade (99.999%), single crystals.

Hazard: Confirmed carcinogen and mutagen. OSHA employee exposure limit:

Use: (Metallic form) Alloying additive for metals, especially lead and copper as shot, battery grids, cable sheaths, boiler tubes. High-purity (semiconductor) Grade: Used to make gallium arsenide for dipoles and other electronic devices; doping agent in germanium and silicon solid state products; special solders; medicine.

See arsenic trioxide.

arsenic acid. (orthoarsenic acid).

CAS: 7778-39-4. $H_3AsO_4 \cdot 1/2H_2O$. Arsenic pentoxide is also sometimes called arsenic acid.

Properties: White, translucent crystals. D 2–2.5, mp 35.5C, bp (loses water at 160C). Soluble in water, alcohol, alkali, glycerol.

Derivation: By digestion of arsenic with nitric acid.

Grade: Pure, technical, CP.

Hazard: Confirmed carcinogen.

Use: Manufacture of arsenates, glass making, wood treating process, defoliant (regulated), desiccant for cotton, soil sterilant.

arsenic acid, aniline salt.

CAS: 63957-41-5. $C_{18}H_{21}N_3 \cdot AsH_3O_4$.

Hazard: A poison by ingestion.

Use: Agricultural chemical.

arsenical Babbitt. See Babbitt metal.

arsenical nickel. See niccolite.

arsenic anhydride. See arsenic pentoxide.

arsenic, black. (β -arsenic).
See arsenic.

arsenic bromide. Legal label name for arsenic tribromide.

arsenic chloride. See arsenic trichloride.

arsenic disulfide. (arsenic monosulfide; ruby arsenic; red arsenic glass; red arsenic sulfide; red arsenic).

CAS: 56320-22-0. As_2S_2 or AsS. Occurs as the mineral realgar.

Properties: Orange-red powder. D 3.4–2.6, mp 307C. Soluble in acids and alkalies; insoluble in water.

Derivation: By roasting arsenopyrite and iron pyrites and sublimation.

Grade: Technical.

Use: Leather industry, depilatory agent, paint pigment, shot manufacture, pyrotechnics, rodenticide, taxidermy.

arsenic hydride. See arsine.

arsenic pentafluoride. AsF_5 . A gas, bp $-52.8C$, fp $-79C$. Readily hydrolyzed, soluble in alcohol and benzene.

Use: Doping agent in electroconductive polymers.

arsenic pentasulfide. As_2S_5 .

Properties: Yellow or orange powder. Soluble in nitric acid and alkalies; insoluble in water. Decomposes to sulfur and the trisulfide when heated.

Derivation: By precipitation from arsenic acid in a hydrochloric acid solution with hydrogen sulfide. It is filtered, then dried.

Grade: Technical.

Use: Paint pigments, light filters, other arsenic compounds.

arsenic pentoxide. (arsenic oxide; arsenic anhydride; arsenic acid).

CAS: 1303-28-2. As_2O_5 .

Properties: White, amorphous solid; deliquescent; forms arsenic acid in water. D 4.086, mp 315C. Soluble in water, alcohol.

Derivation: By action of oxidizing agent, such as nitric acid, on arsenious oxide.

Hazard: Confirmed carcinogen.

Use: Arsenates, insecticides, dyeing and printing, weed killer, colored glass, metal adhesives.

arsenic sesquioxide. See arsenic trioxide.

arsenic sulfide. Legal label name for arsenic disulfide.

ARSENIC THIOARSENATE

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arsenic thioarsenate. As(AsS₄).

Properties: Dry, free-flowing yellow powder, stable, high melting. Insoluble in water and organic solvents, but soluble in aqueous caustics.

Use: Scavenger for certain oxidation catalysts and thermal protectant for metal-bonded adhesives and coating resins.

arsenic tribromide. (arsenic bromide; arsenious bromide; arsenous bromide).

CAS: 7784-33-0. AsBr₃.

Properties: Yellowish-white, hygroscopic crystals. D 3.54 (25C), mp 33C, bp 221C. Decomposed by water.

Derivation: Direct union of arsenic and bromine.

Use: Analytical chemistry, medicine.

arsenic trichloride. (arsenic chloride; arsenious chloride; arsenous chloride; caustic arsenic chloride; fuming liquid arsenic).

CAS: 7784-34-1. AsCl₃.

Properties: Colorless or pale yellow oil. Bp 130.5C, fp -18C, d 2.163 (14/4C). Soluble in concentrated hydrochloric acid and most organic solvents, decomposed by water. Fumes in moist air. Noncombustible.

Derivation: (1) By action of chlorine on arsenic; (2) by distillation of arsenic trioxide with concentrated hydrochloric acid.

Grade: Technical.

Hazard: Strong irritant to eyes and skin.

Use: Intermediate for organic arsenicals (pharmaceuticals, insecticides), ceramics.

See arsenic.

arsenic trifluoride. (arsenious fluoride).

CAS: 7784-35-2. AsF₃.

Properties: Mobile liquid that fumes in air.

Hazard: Extremely toxic.

Use: Fluorinating reagent, catalyst, ion implantation source, and dopant.

arsenic trioxide. (crude arsenic; white arsenic; arsenious acid; arsenious oxide; arsenous anhydride).

CAS: 1327-53-3. As₂O₃.

Properties: White powder; odorless; tasteless. D 3.865. Slightly soluble in water; soluble in acids, alkalis, and glycerol. Sublimes on heating.

Derivation: Smelting of copper and lead concentrates. Flue dust to which pyrite or galena concentrations are added yields As₂O₃ vapor. Condensation gives product of varying purity called crude arsenic (90–95% pure). A higher-purity oxide called white arsenic (99+% pure) is obtained by resubliming the crude As₂O₃.

Hazard: A confirmed carcinogen.

Use: Pigments, ceramic enamels, aniline colors, decolorizing agent in glass, insecticide, rodenticide, herbicide, sheep and cattle dip, hide preservative, wood preservative, preparation of other arsenic compounds.

arsenic trisulfide. (arsenious sulfide; arsenic sulfide [yellow]; arsenous sulfide; arsenic tersulfide).

CAS: 1303-33-9. As₂S₃.

Properties: Yellow crystals or powder, changes to a red form at 170C. D 3.43, mp 300C. Insoluble in water and hydrochloric acid; dissolves in alkaline sulfide solutions and nitric acid.

Derivation: Occurs in nature as the mineral orpiment. May be precipitated from arsenious acid solution by the action of hydrogen sulfide.

Grade: Technical, pigment, single crystals.

Use: Pigment, reducing agent, pyrotechnics, glass used for infrared lenses, semiconductors, hair removal from hides.

arsine. (arsenic hydride).

CAS: 7784-42-1. AsH₃.

Properties: Colorless gas. Fp -113.5C, bp -62C, decomposes 230C. Soluble in water; slightly soluble in alcohol and alkalis.

Derivation: Reaction of aluminum arsenide with water or hydrochloric acid, electrochemical reduction of arsenic compounds in acid solutions.

Grade: Technical, 99% pure or in mixture with other gases.

Hazard: Highly poisonous by inhalation. Peripheral nervous system and vacular system impairment, kidney and liver impairment.

Use: Organic synthesis, military poison, doping agent for solid-state electronic components.

arsphenamine. A specific for syphilis originally developed by Ehrlich, but no longer in use. It was a derivative of arsenic and benzene.

See Ehrlich.

Artic. A refrigeration grade of methyl chloride.**artificial cinnabar.** See mercuric sulfide, red.**artificial snow.** A copolymer of butyl and isobutyl methacrylate, often dispersed from an aerosol bomb or other atomizing device, used in decorative window displays, etc. Man-made snow is crystallized water vapor made by mechanical means.**aryl.** A compound whose molecules have the ring structure characteristic of benzene, naphthalene, phenanthrene, anthracene, etc., (i.e., either the 6-carbon ring of benzene or the condensed 6-carbon rings of the other aromatic derivatives). For example, an aryl group may be phenyl C₆H₅ or naphthyl C₁₀H₉. Such groups are often represented in formulas by "R."

See alkyl.

arylalkyl. A compound containing both aliphatic and aromatic structures, e.g., alkyl benzenesulfonate. Also called aralkyl.

aryl carbamate herbicide. (aryl carbamic ester). Any of a class of herbicides that are absorbed via the roots and have colchicine-like actions.

Hazard: Toxic to monocotyledons; inhibition of oxidative phosphorylation and of RNA and protein synthesis; inhibition of photosynthesis.

Use: Herbicide used to control grasses in crops such as peas and beets.

arylesterase.

CAS: 9032-73-9. Any enzyme that enables the hydrolysis of arylesters.

aryl halide. An aromatic compound with two benzene rings that contain substituted halogens. The two major classes of aryl halides are those based upon naphthalene and the other upon biphenyl.

aryl hydrocarbon hydroxylase. Any of certain isozymes that catalyzes the hydroxylation of aromatic hydrocarbons. Aryl hydrocarbon hydroxylase activity resides in isozymes of cytochrome P-450.

aryne. A hydrocarbon derived from an arene by abstraction of two hydrogen atoms from adjacent carbon atoms. Arynes are commonly represented with a formal triple bond. The analogous heterocyclic compounds are called heteroarynes or heteroarynes.

As. Symbol for arsenic.

as-. Abbreviation for asymmetrical, same as *uns-*.

ASA. (1) American Standards Association. (2) Abbreviation for acrylic ester-modified styrene acrylonitrile terpolymer. See Luran Sulfur.

asarone. See 2,4,5-trimethoxy-1-propenylbenzene.

asbestine. A soft, fibrous magnesium silicate.
Use: As a filler in paper, rubber, and plastics.

asbestos.

CAS: 1332-21-4. A group of impure magnesium silicate minerals that occur in fibrous form.

Properties: White, gray, green, brown. D 2.5. Non-combustible. (1) Serpentine asbestos is the mineral chrysotile, a magnesium silicate. The fibers are strong and flexible, so that spinning is possible with the longer fibers. A microcrystalline form, TM "Avibest," has been developed. (2) Amphibole asbestos includes various silicates of magnesium, iron, calcium, and sodium. The fibers are generally brittle and cannot be spun, but are more resistant to chemicals and to heat than serpentine asbestos. (3) Amosite. (4) Crocidolite.

Occurrence: Vermont, Arizona, California, North Carolina, Africa, Italy, Yukon, Quebec, Mexico,

Hazard: A confirmed carcinogen. Highly toxic by inhalation of dust particles. Pneumoconiosis, lung cancer, mesothelioma.

Use: Fireproof fabrics, brake lining, gaskets, roofing compositions, electrical and heat insulations, paint filler, chemical filters, reinforcing agent in rubber and plastics, component of paper dryer felts, diaphragm cells, cement reinforcement.

Note: A promising substitute for asbestos for cement reinforcement is glass fiber made from slate and limestone.

ascariidida. (ascariorida; ascariidea; ascari-data; ascariidae). An order of large, intestinal, parasitic nematode worms that includes species such as *Ascaris lumbricoides*, that are important to humans. Important genera include *Ascaridia*, *Ascaris*, *Subuluris*, *Heterakis*, and *Anisakis*.

ascaridole. (1,4-peroxido-*p*-menthene-2).

$C_{10}H_{16}O_2$.

Properties: A liquid, naturally occurring peroxide. Bp 84C (5 mm), d 1.011 (13/15C), refr index 1.4743 (20C).

Derivation: By vacuum distillation of chenopodium oil.

Hazard: Strong oxidizing agent, explodes on heating to 130C or in contact with organic acids.

Use: Initiator in polymerization, medicine.

"Ascarite II" [Thomas]. TM for a sodium hydroxide-nonfibrous silicate formulation.

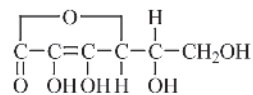
Use: Quantitative absorption of carbon dioxide in the determination of carbon in steel and organic compounds by direct combustion and other analysis.

ascaron. A peptone of certain helminthes, especially ascarids.

Hazard: Toxic.

ascorbic acid. (*l*-ascorbic acid; vitamin C).

CAS: 50-81-7. $C_6H_8O_6$.



A dietary factor that must be present in the diet of humans to prevent scurvy. It cures scurvy and increases resistance to infection. Ascorbic acid presumably acts as an oxidation-reduction catalyst in the cell. It is readily oxidized; citrus juices should not be exposed to air for more than a few minutes before use.

Properties: White crystals (plates or needles). Mp 192C. Soluble in water; slightly soluble in alcohol; insoluble in ether, chloroform, benzene, petroleum ether, oils and fats. Stable to air when dry. One international unit is equivalent to 0.05 milligram of *l*-ascorbic acid.

ASCORBIC ACID OXIDASE

118

Source: Food source: acerola (West Indian cherry); citrus fruits; tomatoes; potatoes; green, leafy vegetables. Commercial sources: Synthetic product made by fermentation of sorbitol.

Grade: USP, FCC.

Use: Nutrition, color fixing, flavoring, and preservative in meats and other foods, oxidant in bread doughs, abscission of citrus fruit in harvesting, reducing agent in analytical chemistry. The iron, calcium, and sodium salts are available for biochemical research.

ascorbic acid oxidase. An enzyme found in plant tissue that acts upon ascorbic acid in the presence of oxygen to produce dehydroascorbic acid.

Use: Biochemical research.

ascorbyl palmitate. $C_{22}H_{38}O_7$. A white or yellowish-white powder having a citrus-like odor. Mp 116–117C; soluble in alcohol and in animal and vegetable oils; slightly soluble in water.

Derivation: Palmitic and *l*-ascorbic acids.

Grade: FCC.

Use: Antioxidant for fats and oils, source of vitamin C, stabilizer, emulsifier.

ascorbyl stearate.

Use: Food additive.

-ase. A suffix characterizing the names of many enzymes, e.g., diastase, cellulase, cholinesterase, etc. However, the names of some enzymes end in *-in* (i.e., pepsin, rennin, papain).

asexual reproduction. A type of reproduction involving only one parent that usually produces genetically identical offspring. Asexual reproduction occurs without meiosis or syngamy, and may happen through budding, by the division of a single cell, or the breakup of an entire organism into two or more parts.

ash. (1) In analytical chemistry, the residue remaining after complete combustion of a material. It consists of mineral matter (silica, alumina, iron oxide, etc.) the amount often being a specification requirement. (2) The end product of large-scale coal combustion as in power plants; now said to be the sixth most plentiful mineral in the U.S. It consists principally of fly ash, bottom ash, and boiler ash. Some of its values are recoverable, and there are a number of industrial uses of fly ash, e.g., in cement products and road fill.

See fly ash.

askarel. A generic descriptive name for synthetic electrical insulating (dielectric) material which, when decomposed by the electric arc, evolves only nonexplosive gases or gaseous mixtures, i.e., chlorinated aromatic derivatives, particularly pentachlorodiphenyl and trichlorobenzene, but also including pentachlorodiphenyl oxide,

pentachlorophenylbenzoate, hexachlorodiphenylmethane, pentachlorodiphenyl ketone, and pentachloroethylbenzene. Nonflammable.

Use: Insulating medium in transformers, dielectric fluid.

See dielectric; transformer oil.

ASM International. (ASM). Formally organized in 1935, this society actually had been active under other names since 1913, when the name for standards of metal quality and performance in the automobile became generally recognized. Most recent previous name was American Society for Metals. ASM International has over 30,000 members and publishes *Metals Review* and the famous *Metals Handbook*, as well as research monographs on metals. It is active in all phases of metallurgical activity, metal research, education, and information retrieval. Its headquarters is at 9639 Kinsman Road, Materials Park, OH 44073. Website: <http://www.asminternational.org>

asparagic acid. See aspartic acid.

L-asparaginase. (L-asnase; colaspase; elspar).

CAS: 9015-68-3. An enzyme used in the treatment of certain types of leukemia. Produced by biochemical activity of certain bacteria, yeasts, and fungi. Yields are in excess of 3500 units/g of source.

asparagine. (α -aminosuccinamic acid; β -asparagine; althein; aspartamic acid; aspartamide). $NH_2COCH_2CH(NH_2)COOH$. The β amide of aspartic acid, a nonessential amino acid, existing in the D(+)- and L(-)-isomeric forms as well as the DL-racemic mixture. L(-)-asparagine is the most common form.

Properties: L(-)-Asparagine monohydrate: White crystals. Mp 234–235C. Acid to litmus. Nearly insoluble in ethanol, methanol, ether and benzene; soluble in acids and alkalis.

Derivation: Widely distributed in plants and animals both free and combined with proteins.

Use: Biochemical research, preparation of culture media, medicine.

l-asparagine.

CAS: 70-47-3. $C_4H_8N_2O_3 \cdot H_2O$.

Properties: White crystalline powder or rhombic hemihedral crystals; sltly sweet taste. Mp: 234C. Sol in water; insol in alc, ether.

Use: Food additive.

asparaginic acid. See aspartic acid.

Aspartame. (3-amino-n-(α -carboxyphenethyl)succinamic acid n-methyl ester, stereoisomer; aspartylphenylalanine methyl ester; n-l- α -aspartyl-l-phenylalanine l-methyl ester; canderel; dipeptide sweetener; Equal; methyl aspartylphenylalanate; l-methyl n-l- α -aspartyl-l-phenylalanine; Nutrasweet; sweet dipeptide). $C_{14}H_{18}N_2O_5$.

Properties: White crystalline powder from water or alcohol; odorless; sweet taste. Mw: 294.34; mp 190. Slightly soluble in water, alcohol. A synthetic non-nutritive sweetener approved by FDA for tabletop use and as a packaged food additive. The U.S., Canada, and South Africa permit its use in carbonated beverages. A combination of aspartic acid and L-phenylalanine, it is said to be 200 times sweeter than sugar.

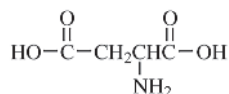
See sweetener, nonnutritive.

aspartamic acid. See asparagine.

aspartamide. See asparagine.

aspartate aminotransferase. (aminotransferase; aminotransaminase; aspartate transaminase; AST; glutamic-aspartic transaminase; (serum) glutamic-oxaloacetic transaminase). An enzyme that catalyzes reversibly the transfer of an amino group from glutamic acid to oxaloacetic acid, yielding α -ketoglutaric acid and aspartic acid. The codons for aspartate are GAC and GAU.

aspartic acid. (asparaginic acid; asparagic acid; aminosuccinic acid). $\text{COOHCH}_2\text{CH}(\text{NH}_2)\text{COOH}$. A naturally occurring nonessential amino acid. The common form is L(+)-aspartic acid.



Properties: Colorless crystals. Soluble in water; insoluble in alcohol and ether. Optically active. DL-aspartic acid. Mp 278–280C (decomposes), d 1.663 (12/12C). L(+)-aspartic acid. Mp 251C. D(–)-aspartic acid. Mp 269–271C (decomposes), d 1.6613.

Source: Young sugar cane, sugar beet molasses.

Derivation: Hydrolysis of asparagine, reaction of ammonia with diethyl fumarate.

Use: Biological and clinical studies, preparation of culture media, organic intermediate, ingredient of aspartame, detergents, fungicides, germicides, metal complexation. Available commercially as DL(–)-, L(+)-, and DL-aspartic acid.

dl-aspartic acid.

CAS: 617-45-8. $\text{C}_4\text{H}_7\text{NO}_4$.

Properties: Colorless to white monoclinic crystals; acid taste. Mp: 280C (decomp). Slightly sol in water; insol in alc, ether.

Hazard: Very low toxicity.

Use: Food additive.

l-aspartic acid.

CAS: 56-84-8. $\text{C}_4\text{H}_7\text{NO}_4$.

Properties: Colorless to white crystals or leaflets; acid taste. Mp: 270C. Slightly sol in water; insol in alc, ether.

Hazard: Low toxicity.

Use: Food additive; drug.

l-aspartic acid, n-acetyl-, dilithium salt. See dilithium n-acetyl-l-aspartate.

aspartocin. USAN for antibiotic produced by *Streptomyces griseus*.

aspergillic acid. (2-hydroxy-3-isobutyl-6-(1-methylpropyl)pyrazine-1-oxide). $\text{C}_{12}\text{H}_{20}\text{N}_2\text{O}_2$. An antibiotic from strains of *Aspergillus flavus*.

Properties: Yellow crystals. Mp 97C. Insoluble in cold water; soluble in common organic solvents and dilute acids. Hydrochloride melts at 178C and is soluble in water.

Use: Antibiotic.

aspergillin. (Gliotoxin; Gladiocladium fimbriatum). $\text{C}_{13}\text{H}_{14}\text{N}_2\text{O}_4\text{S}_2$. A broad-spectrum antibacterial antibiotic.

Properties: Monoclinic crystals from MeOH.

Derivation: Obtained from cultures of the molds *Aspergillus flavus* and *Aspergillus fumigatus*.

Hazard: Poison.

Aspergillus. A genus of small molds and fungi used in industry to ferment carbohydrates for producing citric and other organic acids.

Aspergillus. A genus of imperfect fungi, at least 20 species are known to cause opportunistic infections in humans. *Aspergillus* species are ubiquitous in the environment and are the second most commonly recovered fungus from opportunistic mycoses following those of *Candida* (commonly known as yeast) species. Many *Aspergillus* produce mycotoxins, which are potent toxins.

Hazard: Allergenic, pathogenic, toxic.

ASPET. See American Society of Pharmacology and Experimental Therapeutics.

asphalt. (petroleum asphalt; Trinidad pitch; mineral pitch).

CAS: 8052-42-4. A dark-brown to black cementitious material, solid or semisolid in consistency, in which the predominating constituents are bitumens that occur in nature as such or are obtained as residua in petroleum refining (ASTM). It is a mixture of paraffinic and aromatic hydrocarbons and heterocyclic compounds containing sulfur, nitrogen, and oxygen.

Properties: Black solid or viscous liquid. D approximately 1.0. Soluble in carbon disulfide, flash p 450F (132C), autoign temp 900F (482C), solid softens to viscous liquid at approximately 93C, penetration value (paving) 40–300, (roofing) 10–40. Good electrical resistivity. Combustible.

Occurrence: California, Trinidad, Venezuela, Cuba, Canada (Athabasca tar sands).

ASPHALT (BLOWN)

120

Hazard: Toxic by inhalation of fume. Upper respiratory tract and eye irritant. Probable carcinogen.

Use: Paving and road-coating, roofing, sealing and joint filling, special paints, adhesive in electrical laminates and hot-melt compositions, diluent in low-grade rubber products, fluid loss control in hydraulic fracturing of oil wells, medium for radioactive waste disposal, pipeline and underground cable coating, rust-preventive hot-dip coatings, base for synthetic turf, water-retaining barrier for sandy soils, supporter of rapid bacterial growth in converting petroleum components to protein.

See bacteria; protein; oil sands.

asphalt (blown). (mineral rubber; oxidized asphalt; hard hydrocarbon).

Properties: Black, friable solid obtained by blowing air at high temperature through petroleum-derived asphalt with subsequent cooling. Penetration value 10–40, softening point 85 to 121C. Combustible.

Use: Primarily roofing, as diluent in low-grade rubber products and as thickener in oil-based drilling fluids.

asphalt (cut-back). A liquid petroleum product produced by fluxing an asphaltic base with suitable distillates. (ASTM).

Properties: Flash p 50F(10C) (OC).

Grade: Solution of residue from distillation in carbon tetrachloride, 99.5%.

Hazard: Flammable, dangerous fire hazard.

Use: Road surfaces.

asphaltene. A component of the bitumen in petroleum, petroleum products, malthas, asphalt cements and solid native bitumens. Soluble in carbon disulfide but insoluble in paraffin naphthas. (ASTM). It is composed of polynuclear hydrocarbons of molecular weight up to 20,000, joined by alkyl chains.

asphalt, liquid. See residual oil; asphalt (cut-back).

asphalt (oxidized). See asphalt (blown).

asphalt paint. Asphaltic base in a volatile solvent with or without drying oils, resins, fillers, and pigments. Ground asbestos was frequently used as a component of heavy asphaltic paints for roofing and waterproofing purposes.

Hazard: Flammable, dangerous fire risk.

asphyxiant gas. A gas that has little or no positive toxic effect but that can bring about unconsciousness and death by replacing air and thus depriving an organism of oxygen. Among the so-called asphyxiant gases are carbon dioxide, nitrogen, helium, methane, and other hydrocarbon gases.

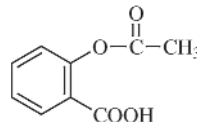
aspidospermine. $C_{22}H_{30}O_2N_2$.

Properties: White to brownish-yellow crystalline alkaloid. Mp 208C, bp 220C (1–2 mm Hg), sublimes at 180C under reduced pressure. Soluble in fats, fixed oils, absolute alcohol, and ether. Its sulfate and hydrochloride are soluble in water.

Use: Medicine (respiratory stimulant).

aspirin. (acetylsalicylic acid; *o*-acetoxybenzoic acid).

CAS: 50-78-2. $CH_3COOC_6H_4COOH$.



Properties: White crystals or white, crystalline powder; odorless; slightly bitter taste. Stable in dry air, slowly hydrolyzes in moist air to salicylic and acetic acids. Mp 132–136C, bp 140C (decomposes). Soluble in water, alcohol, chloroform, and ether; less soluble in absolute ether. Dissolves with decomposition in solutions of alkali hydroxides and carbonates.

Derivation: Action of acetic anhydride on salicylic acid.

Method of purification: Crystallization.

Grade: Technical, USP.

Hazard: An allergen; may cause local bleeding especially of the gums; 10-g dose may be fatal. May cause excessive biosynthesis of prostaglandins. Dust dispersed in air is serious explosion risk. Skin and eye irritant.

Use: Medicine (analgesic, antiinflammatory, antipyretic).

Assam Milk Tea. A less astringent tea brewed by boiling leaves in milk.

assay. (1) The quantitative determination by chemical analysis of metallic values in an ore. Ores are assayed by heat fractionation. (2) Dry assay refers to the determination of metal values in ores by chemical methods not involving the use of solutions. (3) Assay value refers to the proportion of precious metal indicated in ounces of metal per ton of ore. (4) Wet assay is the chemical determination of metal per ton of ore. (5) Pharmaceutical products are assayed to validate the amount of drug present in a given unit. (6) Assays on organisms (bacteria) to determine their reactions to an antibiotic or insecticide. This is called bioassay. Organic materials are assayed by solvent extraction and chemical separation.

assembly. Putting sequenced fragments of DNA into their correct chromosomal positions.

assimilation. The activity whereby different parts of the substrate in a fermentation are changed into cell substance.

assistant. A term loosely used in the textile industry for any chemical compound that aids in a processing step, e.g., scouring, dyeing, bleaching, finishing, etc.

See auxiliary; dyeing assistant.

association. A reversible chemical combination due to any of the weaker classes of chemical bonding forces. Thus, the combination of two or more molecules due to hydrogen bonding, as in the union of water molecules with one another or of acetic acid molecules with water molecules, is called association; also, combination of water or solvent molecules with molecules of solute or with ions, i.e., hydrate formation or solvation. Formation of complex ions or chelates, as copper ion with ammonia or copper ion with 8-hydroxyquinoline is another example. Aqueous solutions of soaps or synthetic detergents are often called association colloids.

association polymer. A polymer formed by simple addition of molecules or by rearrangement of bonds.

A-stage resin. (resole; one-step resin). An alkaline catalyzed thermosetting phenol-formaldehyde-type resin consisting primarily of partially condensed phenol alcohols. At this stage, the product is fully soluble in one or more common solvents (alcohols, ketones) and is fusible at less than 150C. On further heating and without use of a catalyst or additive, the resin is eventually converted to the insoluble, infusible, cross-linked form (C-stage). The A-stage resin is a constituent of most commercial laminating varnishes and is also used in special molding powders.

See B-stage resin; C-stage resin; novolak; phenol-formaldehyde resin.

astatine. At. Nonmetallic element of atomic number 85. Group VIIA of periodic table, aw 211. Heaviest member of the halogen family, has 20 isotopes, all radioactive; derived by α -bombardment of bismuth. The two most stable isotopes have half-lives of approximately 8 hours. Astatine occurs in nature to the extent of approximately one ounce in the entire earth's crust. Like iodine, it concentrates in the thyroid gland. Its use in medicine is still experimental.

aster lake. Red lake pigment having high oil absorption properties.

ASTM. See American Society for Testing and Materials.

Aston, Francis William. (1877–1945). This noted English chemist and physicist carried out much of his work with J. J. Thomson at Cambridge. He was the pioneer investigator of isotopes, and his method of separating the lighter from the heavier atomic nuclei provided the technique that

later developed into the mass spectroscopy, which utilizes a magnetic field for this purpose. Aston received the Nobel Prize for this discovery in 1922, just three years after Rutherford performed the first transmutation of elements. Aston also correctly estimated the energy content of a hydrogen atom and predicted the controlled release of this energy.

“Astracel” [IP]. TM for a group of fast dyes for union shades on polyester-carbon blended fabrics.

Astragal. Dyeing auxiliaries.

Use: In dye processes to ensure level uptake of dyes and give color fastness.

astrazon golden yellow gl. See C.I. basic yellow 28.

astrochemistry. Application of radioastronomy (microwave spectroscopy) to determination of the existence of chemical entities in the gas clouds of interstellar space and of elements and compounds in celestial bodies, including their atmospheres. Such data are obtained from spectrographic study of the light from the sun and stars, from analysis of meteorites, and from actual samples from the moon. Hydrogen is by far the most abundant element in interstellar space, with helium a distant second. Over 25% of the elements, including carbon, have been identified, as well as molecules of water, carbon monoxide, carbon dioxide, ammonia, ethane, methane, acetylene, formaldehyde, formic acid, methyl alcohol, hydrogen cyanide, and acetonitrile. When applied to the planets only, the science is called chemical planetology.

See nucleogenesis.

Astrol. A group of fast alizarin direct blues.

Astro Starch. Cationic potato starches.

Use: As an alkaline-size emulsion stabilizer.

asulam potassium salt. See potassium asulam.

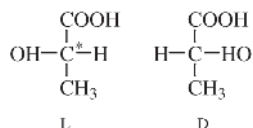
asymmetric carbon atom. One having its four valences held by four different groups or atoms. Compounds possessing asymmetric carbon atoms have optically active isomers.

asymmetric induction. The action of a force, arising in an optically active molecule, that influences adjacent symmetrical molecules in such a way that they become asymmetric.

asymmetric syntheses. Processes that produce optically active compounds from symmetrically constituted molecules by the intermediate use of optically active reagents, but without the use of any of the methods of resolution.

asymmetry. A molecular structure in which an atom having four tetrahedral valences is attached

to four different atoms or groups. The commonest cases involve the carbon atom, though they may exist also with other elements such as nitrogen and sulfur, i.e., lactic acid which contains one asymmetric carbon (indicated by *). In such cases, two optical isomers (L and D enantiomers) result that are nonsuperposable mirror images of each other.

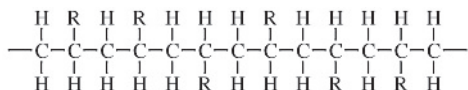


Amino acids are also characterized by asymmetric carbons. Many compounds have more than one asymmetric carbon, e.g., tartaric acid, sugars, terpenes, etc. This results in the possibility of many optical isomers, the number being determined by the formula 2^n , where n is the number of asymmetric carbons.

See optical isomer; enantiomer; glyceraldehyde.

At. Symbol for astatine.

atactic. A type of polymer molecule in which substituent groups or atoms are arranged randomly above and below the backbone chain of atoms when the latter are all in the same plane, as shown below. See polymer, stereospecific.



ATBC. (acetyltri-*n*-butyl citrate).

CAS: 77-90-7. Aqueous-based pharmaceutical coatings.

ATE. Abbreviation for aluminum triethyl.

See triethyl aluminum.

-ate. A suffix having two different meanings. (1)

In inorganic compounds, it indicates a salt whose metal or radical is in the highest oxidation state, as in calcium sulfate, ammonium nitrate, etc. (2) In engineering terminology, it means "result of," as in precipitate, condensate, alkylate, distillate, etc.

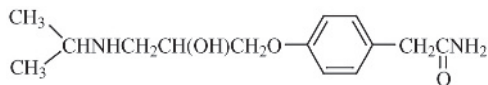
ATEC. (acetyltriethyl citrate).

CAS: 77-89-4. Aqueous-based pharmaceutical coatings.

atenolol. (1,*p*-carbamoylmethylphenoxy-3-isopropylamino-2-propanol). $\text{C}_{14}\text{H}_{22}\text{N}_2\text{O}_3$.

Properties: Colorless crystals. Mp 147°C.

Use: An adrenergic blocker used in treatment of hypertension. FDA approved.



ATG or AUG. The codon for methionine; the translation initiation codon. Usually, protein translation can only start at a methionine codon (although this codon may be found elsewhere within the protein sequence as well). In eukaryotic DNA, the sequence is ATG; in RNA it is AUG. Usually, the first AUG in the mRNA is the point at which translation starts, and an open reading frame follows, i.e., the nucleotides taken three at a time will code for the amino acids of the protein, and a stop codon will be found only when the protein coding region is complete.

atlantic black gac. See apomine black gx.

ATM. Abbreviation for aluminum trimethyl.

See trimethyl aluminum.

atmolysis. The separation of admixed gases by means of a porous partition. Use is made of the different speeds at which the gases diffuse.

atmosphere. (1) The gaseous envelope that surrounds the earth. It comprises of four major divisions: the troposphere (from sea level to approximately 10 km), the stratosphere (ozone region) which extends from approximately 10 to 50 km, the mesosphere which extends from approximately 50 to 100 km, and the thermosphere which ranges from approximately 100 to 1000 km or more. There is no sharp boundary between the layers. The pressure drops rapidly as altitude increases (from 1 atm at sea level to 10^{-13} atm at 1000 km). The chemical entities and reactions that occur in these spheres are the subject of extensive research. (2) The pressure exerted by the air at sea level (14.696 psi), which will support a column of mercury 760 mm high (approximately 30 inches). This is standard barometric pressure, though it varies slightly with local meteorological conditions. It is often used to indicate working pressures of steam. The accepted abbreviation is *atm*. (3) Any environmental gas or mixture of gases, e.g., an atmosphere of nitrogen or an inert atmosphere.

atmosphere (controlled). As used in the technology of food preservation and storage, a gaseous environment in which the concentrations of oxygen, carbon dioxide, and nitrogen are held constant at a specific level, the temperature also being controlled. Controlled atmosphere storage techniques are used on a commercial scale in the U.S.

atmospheric pollution. See air pollution.

Atnul. (glycerol monostearate).

CAS: 31566-31-1. An intermediate chemical.

Use: For food processing and baking, snack goods, pharmaceuticals, plastics, paints, coatings, and cosmetics.

atom. The smallest possible unit of an element, consisting of a nucleus containing one or more protons and (except hydrogen) one or more neutrons, and one or more electrons which revolve around it. The protons are positively charged, the neutrons have no charge, the electrons are negatively charged. As each atom contains the same number of protons as electrons, the atom is electrically neutral. Atoms in general are characterized by stability. One might wonder why the negatively charged electrons are not attracted into the positively charged nucleus in response to the law of opposite charges, causing the atom to collapse on itself. That this does not occur is due to the nature of the electron, which is not only a particle but also a standing quantum wave. As explained by Dr. W. V. Houston, "The normal state of an atom is balance between the attraction of the nucleus for the electron wave and what might be called the elastic resistance to compression of the wave itself."

Atoms of the various elements differ in mass (weight), that is, in the number of neutrons and protons and also in the number of electrons. Atoms of a given element are identical, except that an element may have atoms of different masses, called isotopes. Individual atoms of uranium and thorium have been resolved at 5 Å in the scanning electron microscope. Motion pictures of uranium atoms at magnification of 7.5 million times have been made at the Enrico Fermi Institute at the University of Chicago.

Atoms of the same or different elements combine to form molecules. When the atoms are of two or more different elements, these molecules are called compounds. Atoms remain essentially unchanged in chemical reactions except that some of the outermost electrons may be removed, shared, or transferred as occurs in oxidation, ionization, and chemical bonding. A few atomic species disintegrate as a result of nuclear changes and thus are radioactive. Heavy unstable atoms such as uranium-235 and plutonium can be split by bombardment with high-energy particles yielding tremendous energy. See electron; proton; bonds, chemical; orbital theory; ionization; radioactivity; fission.

atom-cavity microscope. A technique that traps single atoms in a magneto-optical trap and are dropped through a high-finesse optical cavity. A laser probe measures atomic motions.
Use: Study of atomic-scale motions of single atoms. See scanning tunneling microscope; chemical force microscopy.

atom form factor. (atomic scattering factor; atomic structure factor; *f*-value). Quantity in the expression for the intensity of an X-ray beam reflected by a crystal, whose value is dependent on the varying configuration of the electrons in the crystal atoms relative to the nuclei, as well as on the incident angle and the wave length of the X-rays.

atomic absorption coefficient. Ratio of absorption coefficient of an element to the number of atoms per unit volume.

atomic absorption spectroscopy. An analytical technique in which the substance to be analyzed is converted into an atomic vapor by spraying a solution into an acetylene-air flame. Some types of compounds require a reducing flame, such as acetylene-nitrous oxide. The absorbance at a selected wavelength is measured and compared with that of a reference substance. The absorbance measured is proportional to the concentration.

atomic energy. See nuclear energy.

atomic force microscopy. /D A technique similar to scanning tunneling microscopy employing an instrument that uses a sharply tipped electrode in close proximity to a surface. As the electrode is moved, the change in electrode signal relates to the shape of the surface being scanned.

Use: Study of atomic-scale structure of surfaces, transport of atoms and molecules. See scanning tunneling microscope; chemical force microscopy.

atomic hydrogen welding. A method of welding in which hydrogen gas is passed through an arc between two tungsten electrodes. The arc breaks down the molecules to form atomic hydrogen. The recombination of the atoms to form molecules and the combustion of the molecular hydrogen in atmospheric oxygen produce a flame temperature of 4000–5000C.

atomic number. The number of protons (positively charged mass units) in the nucleus of an atom, upon which its structure and properties depend. This number represents the location of an element in the periodic table. It is normally the same as the number of negatively charged electrons in the shells. Thus, an atom is electrically neutral except in an ionized state, when one or more electrons have been gained or lost. Atomic numbers range from 1, for hydrogen, to 109 for meitnerium.
See periodic table; atomic weight; mass number.

atomic radius. One-half the distance between two adjacent atoms in crystals of elements. It varies according to interatomic forces.

atomic scattering factor. See atom form factor.

atomic structure factor. See atom form factor.

atomic susceptibility. Product of the specific or mass susceptibility of an element and its atomic weight.

atomic theory. See Dalton, John.

ATOMIC VOLUME

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atomic volume. The atomic weight of an element divided by its density.

atomic weight. (aw). The average weight or mass of all the isotopes of an element as determined from the proportions in which they are present in a given element, compared with the mass of the 12 isotope of carbon (taken as precisely 12.000), which is the official international standard. The true atomic weight of carbon when the masses of its isotopes are averaged is 12.01115; that of oxygen is 15.9994. The total mass of any atom is the sum of the masses of all its constituents (protons, neutrons, and electrons). Official atomic weight determinations are released periodically by the IUPAC. See atomic number; mass number.

ATP. Abbreviation for adenosine triphosphate.

ATPase. An enzyme that hydrolyzes ATP to yield ADP and phosphate; usually coupled to some process requiring energy such as the sodium potassium ATPase.

ATP synthase. An enzyme complex that forms ATP from ADP and phosphate during oxidative phosphorylation in the inner mitochondrial membrane or the bacterial plasma membrane, and during photophosphorylation in chloroplasts. Uses a proton gradient to chemiosmotically drive the synthesis.

atracurium. (tracium; benzenesulfonate; benzenesulfonate; 5-[3-[1-[(3,4-dimethoxyphenyl)methyl]-6,7-dimethoxy-2-methyl-3,4-dihydro-1H-isoquinolin-2-ium-2-yl]propanoyloxy]pentyl-3-[1-[(3,4-dimethoxyphenyl)methyl]-6,7-dimethoxy-2-methyl-3,4-dihydro-1H-isoquinolin-2-ium-2-yl]propanoate). C₆₅H₈₂N₂O₁₈S₂. A nondepolarizing neuromuscular blocking agent with short duration of action.

Hazard: Extremely toxic.

atranorin.

CAS: 479-20-9. C₁₉H₁₈O₈.

Hazard: A poison by skin contact. A skin irritant.

atrazine. (2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine).

CAS: 1912-24-9.

Hazard: Hematologic, preproductive and developmental effects. Questionable carcinogen.

Use: Herbicide, plant growth regulator, and weed-control agent for corn, etc., and for noncrop and industrial sites. Reported to inhibit photosynthesis of algae in streams.

atropine. (datarine).

CAS: 51-55-8. C₁₇H₂₃NO₃. An alkaloid obtained from species of *Atropa*, *Datura*, or *Hyoscyamus*.

Properties: White crystals or powder. Optically inactive (but usually contains levorotatory hyoscyamine). Mp 114–116C. Soluble in alcohol, ether, chloroform, and glycerol; slightly soluble in water.

Derivation: By extraction from *Datura stramonium* or by synthesis.

Grade: Technical, NF.

Use: Medicine (antidote for cholinesterase-inhibiting compounds, organophosphorus insecticides, nerve gases); artificial respiration may also be necessary.

Attack All. A laundry detergent containing bleach, disinfectant, deodorizer, and softener in one.

attapulgit.

CAS: 12174-11-7. (MgAl)₅Si₈O₂₂(OH)₄•4H₂O. A hydrated aluminum-magnesium silicate, the chief ingredient of fuller's earth.

Hazard: Possible carcinogen.

Use: Drilling fluids, decolorizing oils, filter medium. See clay.

attar. (otto). An essential oil (fragrance) made by steam distillation of flowers, especially roses. See essential oil; perfume.

attenuator. An RNA sequence involved in regulating the expression of some prokaryotic genes.

atto- (a).

Prefix meaning 10⁻¹⁸ unit (abbreviated a), e.g., 1 ag = 1 attogram (10⁻¹⁸ g).

attrition mill. (burr mill). A grinding machine consisting of two metal plates or discs with small projections (burrs). One plate may be stationary while the other rotates, or both may rotate in opposite directions. Feed enters through a hopper above the plates, and ground product emerges at the bottom. There are numerous variations in design.

Au. Symbol for gold, from Latin *aurum*.

aua. ((1R,2R)-2-[(1S,2S)-2-[[2S)-2-[[2S)-2-acetamido-4-methylpentanoyl]amino]-4-methylsulfanylbutanoyl]amino]-1-hydroxy-4-methylpentyl)-N-[(2S)-1-(butylamino)-3-methyl-1-oxobutan-2-yl]-4-oxocyclopentane-1-carboxamide). A codon of isoleucine that directs the placement of isoleucine into a polypeptide.

AUG. See initiation codon.

auger. See screw.

Auger electron. Low-energy conversion electron produced by absorption of X-ray quanta by an electron of an outer shell.

See AES; spectroscopy.

auramine. [4,4'-(imidocarbonyl)bis(*N,N*-dimethylaniline)].
CAS: 492-80-8. $(\text{CH}_3)_2\text{NC}_6\text{H}_4(\text{C}:\text{NH})\text{C}_6\text{H}_4\text{N}(\text{CH}_3)_2\cdot\text{HCl}$.

Properties: Yellow flakes or powder. Soluble in water, alcohol, and ether.

Hazard: Confirmed carcinogen.

Use: Yellow dye for paper, textiles, leather; antiseptic; fungicide.

auramine hydrochloride. (yellow pyoktanin; 4-[4-(dimethylamino)benzenecarboxyl]-*N,N*-dimethylaniline hydrochloride).

CAS: 2465-27-2. $\text{C}_{17}\text{H}_{22}\text{ClN}_3$. An aniline dye. It is weakly fluorescing and binds specifically to certain proteins.

Properties: A yellow, water-soluble, crystalline compound, soluble in ethanol.

Hazard: Probable carcinogen.

Use: A commercial dye, a disinfectant and antiseptic agent.

aureolin. See Indian yellow.

“Aureomycin” [Zoetis]. TM for chlortetracycline hydrochloride. An antibiotic. Must conform to FDA requirements.

p. aureus. (mung bean; black gram; golden gram; green gram; gram; mungo bean). An annual herb (Family Fabaceae) with green or yellow seeds, that is indigenous to Asia. Both the seeds and sprouts are edible.

Use: Forage or green manure.

Auric. A ferric oxide brown pigment.

auric compounds. See gold compounds.

aurin (p-rosolic acid). $(\text{C}_6\text{H}_4\text{OH})_2\text{CC}_6\text{H}_4\text{O}$. A triphenylmethane derivative.

Properties: Reddish-brown pieces with greenish metallic luster; easily powdered. Insoluble in water, benzene, and ether; soluble in alcohol.

Use: Indicator, dye intermediate.

aurous compounds. See gold compounds.

austenite. A component of steel, a nonmagnetic solid solution of carbon or ferric carbide in γ -iron. Very unstable below its critical temperature, but may be obtained in high-carbon steels by rapid quenching from high temperatures. Addition of manganese and nickel lowers critical transition temperature, and stable austenite may be obtained at room temperature. Characterized by a face-centered cubic lattice.

austenitic alloys. (austenitic steels). Alloys of iron, chromium, and nickel noted for their resistance to corrosion.

Australian bark. See wattle bark.

authentic protein. A recombinant protein that has all the properties of its naturally occurring counterpart.

autocatalysis. A catalytic reaction induced by a product of the same reaction. This occurs in some types of thermal decomposition, in autoxidation, and in many biochemical systems, as when an enzyme activates its own precursor. See autoxidation.

autoclave. A chamber, usually of cylindrical shape, provided with a door or gate at one end which can be securely closed during operation. It is built heavily enough to accommodate steam pressures of considerable magnitude. It is used to effect chemical reactions requiring high temperature and pressure, such as open-steam vulcanization of rubber. Sizes vary from laboratory units to production size, which may be over 50 ft long and three or more feet in diameter. The latter are provided with baffles to ensure equal distribution of the entering steam. Autoclaves are also used in certain sterilization processes.

“Autofloc” [Nalco]. TM for computerized apparatus in mining.

Use: For monitoring and control of clarification/thickening operations.

autohemplysin. An autoantibody that lyses erythrocytes in the presence of complement in the same individual in whose body the lysine is produced.

autohesion. The formation of a bond between two contiguous surfaces of the same material, when they are pressed together.

autoignition point. (autoignition temperature; autoign temp). The minimum temperature required to initiate or cause self-sustained combustion in any substance in the absence of a spark or flame. This varies with the test method. Some approximate autoignition temperatures follow:

phenol	715C (1319F)
acetone	537C (1000F)
aniline	537C (1000F)
toluene	537C (1000F)
magnesium powder	472C (883F)
butane	430C (806F)
amyl acetate	398C (750F)
pine shavings	265C (507F)
cotton batting	230C (446F)
ethyl ether	180C (356F)
nitrocellulose film	137C (279F)
carbon disulfide	100C (212F)

See flash point for additional ignition properties.

AUTOINTOXICANT

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autointoxicant. Any endogenous substance, metabolic waste or toxicant in the excreta of an organism to which it or its progeny may be exposed.

autoionization. Spontaneous dissociation of a molecule.

autoisolysin. An antibody that lyses cells in the presence of complement in the individual in whose body the lysine is formed and in other individuals of the same species.

autolysin. (autocytolysin). An antibody that is responsible for autolysis.

autolysis. Hydrolysis by tissue proteases; self digestion.

autolyte. A substance that conducts an electric current by itself without requiring a dissolved salt to carry the current.

autolytic enzyme. An enzyme that causes lytic disintegration of the cell that produced it.

autolyzed yeast extract. See baker's yeast extract.

automatic control. Maintenance of desired process conditions (temperature, pressure, etc.) by means of sensing devices that function either electromechanically (thermostat) or electronically (feedback). Applicable to many operations and processes in the chemical industries, such as petroleum refining, evaporation, distillation, heat transfer, electroplating, calendering, extrusion, and many others. Automatic control is not identical with automation.

See instrumentation.

automation. Substitution of specially designed machines for manual labor in such mechanical operations as wrapping, packaging of small units, filling and capping bottles, sealing cans and containers, and materials feeding and proportioning. Automated procedures are much more efficient than manual and effect notable cost savings provided that the machinery is reliable. Do not confuse automation with automatic control.

automotive exhaust emission. See air pollution.

autonomic agent. A substance that inhibits or intensifies the rate of nerve impulse transmission across synaptic junctions, especially those of the autonomic nervous system.

autonomic poison. A poison that acts on the autonomic nervous system.

Hazard: Causes miosis, bronchoconstriction, salivation, lacrimation, respiratory failure, cardiovascular collapse, and death.

autoradiography. A technique that uses X-ray film to visualize radioactively labeled molecules or fragments of molecules.

Use: In analyzing length and number of DNA fragments after they are separated by gel electrophoresis.

autosomal dominant. A gene on one of the non-sex chromosomes that is always expressed, even if only one copy is present. The chance of passing the gene to offspring is 50% for each pregnancy.

See autosome; dominant; gene.

autosome. A chromosome not involved in sex determination. The diploid human genome consists of a total of 46 chromosomes: 22 pairs of autosomes, and 1 pair of sex chromosomes (the X and Y chromosomes).

See sex chromosome.

autotroph. An organism that can synthesize its own complex molecules from simple carbon and nitrogen sources, such as CO₂ and NH₃.

autoxidation. (autooxidation). A spontaneous, self-catalyzed oxidation occurring in the presence of air. It usually involves a free-radical mechanism. It is initiated by heat, light, metallic catalysts, or free-radical generators. Industrial processes, such as manufacture of phenol and acetone from cumene, are based on autoxidation. Other instances are the drying of vegetable oils, the spoilage of fats, gum formation in lubricating oils, and the degradation of high polymers exposed to sunlight for long periods. See autocatalysis.

auu. A codon of isoleucine that directs the placement of isoleucine into a polypeptide.

Auwers-Skita rule. In its original form, the rule stated that in *cis-trans* isomeric hydroaromatic compounds, the *cis* had the higher density and refractive index and the lower molecular refractivity. A more modern statement of the von Auwers-Skita rule (which has undergone several modifications since it was first enunciated) is that, among alicyclic epimers not differing in dipole moment, the isomer of highest heat content has the higher density, index of refraction, and boiling point.

Auwers synthesis. Expansion of coumarones to flavonols by treatment of 2-bromo-2-(α -bromobenzyl)coumarones with alcoholic alkali.

auxiliary. Any of a number of chemical compounds used in some phase of textile processing. They may be classified as follows: (1) fats, oils, and waxes; (2) starches, gums, and glues (sizing); (3) soaps and detergents; (4) inorganic chemicals (bleaching, mercerizing); (5) organic solvents; (6)

special-purpose products (flameproofing, mildewproofing, repellent and decorative coatings, and permanent-press resins). They are sometimes also called assistants.

auxin. A natural or synthetic plant growth hormone that regulates longitudinal cell structure so as to permit bending of the stalk or stem in phototropic response. The natural materials are formed in small amounts in the green tips of growing plants, in root tips, and on the shaded side of growing shoots. 3-Indoleacetic acid is the most important natural auxin.

See plant growth regulator.

auxin herbicide. Any of a number of synthetic auxins used as herbicides. While these herbicides often cause dedifferentiation and the initiation of cell division in mature cells, they usually inhibit cell division in the primary meristems of intact plants.

auxochrome. A radical or group of atoms whose presence is essential in enabling a colored organic substance to be retained on fibers. The best examples are the groups $-\text{COOH}$, $-\text{SO}_3\text{H}$, $-\text{OH}$, and $-\text{NH}_2$.

auxoflore. An atom or group of atoms present in a molecule, that shifts the fluorescent radiation of the atom toward a shorter wavelength, or increases the fluorescence.

Auxogluc. An atomic group within a molecule that heightens sweetness.

auxotox. An atomic group which, when present in the molecules of a compound, confers or intensifies the toxicity of the compound.

auxotroph. See auxotrophic mutant.

auxotrophic mutant. (auxotroph). A mutant organism defective in the synthesis of a given biomolecule, which must therefore be supplied for the organism's growth.

“Avadex [Gowan]. TM for a series of liquid or granular herbicides containing 2,3-dichloroallyl diisopropylthiocarbamate. Widely used to control growth of wild oats in agricultural crops.

Hazard: By ingestion and inhalation.

Availaphos. A mineral supplement supplying phosphorus and calcium in readily available form for animal and poultry feeds.

avalite.

Properties: Claylike silicate containing chromium.

Avantia. A pharmaceutical tablet-coating systems.

“Avelox Tabs” [Bayer]. TM for film coated tablets.

Use: Treatment of bacterial bronchitis, pneumonia and sinusitis.

avermectin. $\text{C}_{48}\text{H}_{72}\text{O}_{14}$. Any of a group of broad spectrum antiparasitic antibiotics produced by the actinomycete, *Streptomyces avermitilis*.

Hazard: Toxic.

Use: Sprayed on wool as a protection against moths and beetles.

avermectin b₁.

CAS: 71751-41-2.

Hazard: A poison by ingestion. Moderately toxic by inhalation and skin contact.

Use: Agricultural chemical.

avermectin b_{1a}.

CAS: 65195-55-3. $\text{C}_{48}\text{H}_{72}\text{O}_{14}$.

Hazard: A poison by ingestion. Moderately toxic by skin contact.

Use: Food additive; insecticide; miticide; agricultural chemical.

aviation gasoline. See gasoline.

Avibest. A microcrystalline form of asbestos.

“Avicel” [FMC]. TM for microcrystalline cellulose, a highly purified particulate form of cellulose.

Properties: Particle size ranges from less than 1 to 150 microns (average varies with grade), density 1.55 (bulk density 0.3–0.5). Insoluble in dilute acids, organic solvents, oils; swells in dilute alkali. Dispersible in water to form stable gels or pourable suspensions. Adsorbs oily and syrupy materials.

Use: Aid to stabilization and emulsification, ingredient in foods, suspending agent, binder and hardening agent in tableting, separatory medium in column and thin-layer chromatography, pure cellulose raw material.

avidin. A protein occurring in egg white, where it constitutes approximately 0.2% of the total protein. It has the property of combining firmly with biotin and rendering it unavailable to organisms, since proteolytic enzymes do not destroy the avidin-biotin complex. Avidin loses its ability to combine with biotin when subjected to heat; hence cooked egg white does not lead to biotin deficiency.

“Avitene” [C. R. Bard]. TM for a microcrystalline form of collagen.

“Avitex” [Du Pont]. TM for a group of textile softeners, lubricants, and antistatic agents. Both anionic and cationic types are available.

Avitex. A group of textile softeners, lubricants, and antistatic agents. Both anionic and cationic types are available.

“AVITONE”

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“Avitone” [Du Pont]. TM for a group of chemical compounds based on hydrocarbon sodium sulfonates that are used principally as softening lubricating and finishing agents for textiles, leather, and paper.

avocado oil. An edible oil high in unsaturated fatty acids.

Properties: Greenish oil; faint odor, bland taste. D 0.91, acid value 1–7, saponification value 177–198, iodine value 71–95, fp 7–9C, refr index 1.461–1.465 (40C).

Use: Cosmetic creams, hair conditioners, suntan preparations, salad oils.

Avogadro’s law. A principle stated in 1811 by the Italian chemist Amadeo Avogadro (1776–1856) that equal volumes of gases at the same temperature and pressure contain the same number of molecules regardless of their chemical nature and physical properties. This number (Avogadro’s number) is 6.023×10^{23} . It is the number of molecules of any gas present in a volume of 22.41 L and is the same for the lightest gas (hydrogen) as for a heavy gas such as carbon dioxide or bromine. Avogadro’s number is one of the fundamental constants of chemistry. It permits calculation of the amount of pure substance in a mole, the basis of stoichiometric relationships. It also makes possible determination of how much heavier a simple molecule of one gas is than that of another; as a result the relative molecular weights of gases can be ascertained by comparing the weights of equal volumes. Avogadro’s number (conventionally represented by “N” in chemical calculations) is now defined to be the number of atoms present in 12 g of the carbon-12 isotope (one mole of carbon-12) and can be applied to any type of chemical entity.

See mole.

avuncular relationship. The genetic relationship between nieces and nephews and their aunts and uncles.

“Axell” [Accurate]. TM for polyclonal antibodies.

“AxellPrep” [Accurate]. TM for products for the isolation of human mononuclear cells.

axis of symmetry. An imaginary line in a crystal. The crystal, when rotated around this line through 360°, shows the same crystal face, at least twice.

“Axyll” [Accurate]. TM for monoclonal antibodies.

aza-. Prefix indicating the presence of nitrogen in a heterocyclic ring.

3-azabicyclo(3,2,2)nonane. $C_8H_{15}N$.

Properties: White-tan solid. Mp 180C (sublimes). Partly soluble in water; solubility decreases with an increase in temperature. Readily soluble in alcohol, bulk d 4.67 lb/gal (20C).

Use: Intermediate for the preparation of pharmaceuticals and rubber chemicals.

1-azabicyclo(2.2.2)octane. See quinuclidine.
azabicyclooctanol methyl bromide diphenylacetate.

CAS: 69766-47-8. $C_{22}H_{26}NO_2 \cdot Br$.

Hazard: A poison.

azaguanine. (5-amino-2,3-dihydrotriazolo[4,5-d]pyrimidin-7-one).

CAS: 134-58-7. $C_4H_4N_6O$. One of the early purine analogs showing antineoplastic activity. It functions as an antimetabolite and is easily incorporated into ribonucleic acids.

Hazard: Mitotoxic poison.

8-azaguanine. (5-amino-1,4-dihydro-7H-1,2,3-triazolo[4,5-d]pyrimidin-7-1).

CAS: 134-58-7. $C_4H_4N_6O$.

Properties: Crystals from dilute aqueous sodium hydroxide. Insoluble in water, alcohol, and ether.

Grade: Refined.

Use: Inhibitor of purine synthesis.

azane. H_3N . Any of a class of saturated acyclic nitrogen hydrides.

Properties: Colorless, alkaline gas.

Derivation: Formed in the body during decomposition of organic materials during a large number of metabolically important reactions.

azaserine. (azaserin; *L*-azaserine; AZS; CI-337; CN-15,757; diazoacetate (ester)-*L*-sterine; *L*-diazoacetate (ester) serine; diazo-acetic acid ester with Serine; NSC-742; P-165; RCRA water Number U015; *L*-serine diazoacetate(ester); serine diazoacetate; *O*-*O*-diazoacetyl-*L*-serine; *O*-diazoacetyl-*L*-serine; (E)-1-(2-amino-3-hydroxy-3-oxopropoxy)-2-diazonioethenolate).

CAS: 115-02-6. $C_5H_7N_3O_4$. An inhibitor of purine synthesis.

Properties: Light-yellow needles from EtOH.

Derivation: Produced by the strain *Streptomyces fragilis*.

Hazard: Toxic; possible carcinogen; neoplastigenic; tumorigenic; poison; teratogen; mutagen.

Use: Antibiotic; antifungal; antineoplastic agent.

azaspiracid.

CAS: 214899-21-5. $C_{47}H_{71}NO_{12}$.

Hazard: A poison by ingestion.

2-azaspiro(5.5)undec-7-ene.

CAS: 6671-96-1. $C_{10}H_{17}N$.

Hazard: A poison by ingestion and skin contact. A severe skin and eye irritant.

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azathioprine. (Imuran).

CAS: 446-86-6. An immunosuppressive drug administered for the purpose of inhibiting the natural tendency of the body to reject foreign tissues by one or more types of immunizing reactions, i.e., formation of leucocytes or antibodies. It has been used with some success in cases of kidney and liver transplants.

Hazard: Confirmed carcinogen.

6-azauridine. (6-azauracil riboside; *as*-triazine-3,5(2*H*,4*H*)dione riboside).

CAS: 54-25-1. $C_8H_{11}N_3O_6$.

Derivation: Microbiological fermentation.

Use: Research on cell formation and cancer.

azelaic acid. (nonanedioic acid; 1,7-heptanedicarboxylic acid).

$HOOC(CH_2)_7COOH$.

Properties: Yellowish to white, crystalline powder.

Mp 106C, bp 365C (decomposes). Soluble in hot water, alcohol, and organic solvents.

Derivation: Oxidation of oleic acid by ozone.

Grade: Technical.

Use: Organic synthesis, lacquers, product of hydrotropic salts, alkyd resins, polyamides, polyester adhesives, low-temperature plasticizers, urethane elastomers.

azelaoyl chloride.

$ClOC(CH_2)_7COCl$.

Properties: Bp 125–130C (3 mm). Slowly decomposes in cold water; soluble in hydrocarbons and ethers.

Use: Organic synthesis.

azeotrope. See azeotropic mixture.

azeotropic distillation. A type of distillation in which a substance is added to the mixture to be separated in order to form an azeotropic mixture with one or more of the components of the original mixture. The azeotrope or azeotropes thus formed will have boiling points different from the boiling points of the original mixture and will permit greater ease of separation.

azeotropic mixture. (azeotrope). A liquid mixture of two or more substances which behaves like a single substance in that the vapor produced by partial evaporation of liquid has the same composition as the liquid. The constant boiling mixture exhibits either a maximum or minimum boiling point as compared with other mixtures of the same substances.

azide. Any of a group of compounds having the characteristic formula $R(N_3)_x$. R may be almost any metal atom, a hydrogen atom, a halogen atom, the ammonium radical, a complex ($[CO(NH_3)_6]$, $[Hg(CN)_2M]$ with M = Cu, Zn, Co, Ni) an organic

radical like methyl, phenyl, nitrophenol, dinitrophenol, *p*-nitrobenzyl, ethyl nitrate, etc., and a variety of other groups or radicals. The azide group has a chain structure rather than a ring structure. All the heavy metal azides, such as hydrogen azide, and most if not all of the light metal azides (under appropriate conditions) are explosive. They should be handled with utmost care and protected from light, shock, and heat. Many of the organic azides are also explosive.

See lead azide; hydrazoic azide.

aziminobenzene. See 1,2,3-benzotriazole.

azimino compounds. Stable heterocyclic compounds having three adjacent nitrogen atoms in one ring.

azimsulfuron.

CAS: 120162-55-2. $C_{13}H_{16}N_{10}O_5S$.

Hazard: Low toxicity by ingestion, inhalation, and contact. A mild eye irritant.

azine dye. A class of dyes derived from phenazine. $(C_6H_4)_2N_2(C_6H_4)$ (tricyclic). The chromophore group may be $=C=N-$, but the color is more probably due to the characteristic unsaturation of the benzene rings. The members of the group are quite varied in application. The nigrosines (CI 50415–50440) and safranines (CI 50200–50375) are examples of this group.

See dye, synthetic.

aziphos methyl. (*O,O*-dimethyl-*S*-4-oxo-1,2,3-benzotriazin-3(4*H*)-yl methyl phosphorodithioate; Guthion).

CAS: 86-50-0. $C_{10}H_{12}N_3O_3PS_2$.

Properties: Brown, waxy solid. Mp 73C. Slightly soluble in water; soluble in most organic solvents.

Hazard: A poison, cholinesterase inhibitor. Absorbed by skin. Questionable carcinogen.

Use: Insecticide for fruit. Use may be restricted.

aziridine. A compound based on the ring structure.

See ethyleneimine; ethylethyleneimine; propyleneimine; polypropyleneimine; 1-aziridineethanol.

1-aziridineethanol. (*N*-(2-hydroxyethylethyleneimine)).

CAS: 1072-52-2. $C_2H_4NCH_2CH_2OH$.

Properties: Colorless liquid. Bp 167.9C, flash p 185F (OC). Combustible.

Handling: Inhibited with 1–3% dissolved sodium hydroxide.

Hazard: Irritant to skin and eyes.

Use: Chemical intermediate.

1-aziridinepropionic acid, cinnamyl ester.

CAS: 99900-94-4. $C_{14}H_{17}NO_2$.

Hazard: A poison.

A-Z LITE

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A-Z Lite. A corrosion inhibitor.**Use:** In cooling tower systems.**azlon.** Generic name for a manufactured fiber in which the fiber-forming substance is composed of any regenerated naturally occurring protein (FTC). Proteins from corn, peanuts, and milk have been used. Azlon fiber has a soft hand, blends well with other fibers, and is used like wood. Combustible.**azobenzene.** (diphenyldiimide; benzeneazobenzene).CAS: 103-33-3. $C_6H_5N_2C_6H_5$.**Properties:** Yellow or orange crystals. Mp 68C, bp 297C, d 1.203 (20/4C). Soluble in alcohol and ether; insoluble in water. Combustible.**Derivation:** Reduction of nitrobenzene with sodium stannite.**Hazard:** Toxic; may cause liver injury. Questionable carcinogen.**Use:** Manufacture of dyes and rubber accelerators, fumigant, acaricide.**azobenzene-*p*-sulfonic acid.** $C_{12}H_{10}O_3N_2S$.**Properties:** Orange crystals. Mp 129C.**Use:** Intermediate and reagent chemicals.**4,4'-azobis(4-cyanovaleric acid).**CAS: 2638-94-0. $[=NC(CH_3)(CN)CH_2CH_2CO_2H]_2$.**Properties:** Light sensitive. Mp 90C (decomposes), mw 280.28.**Grade:** 80% solution in water.**Hazard:** Toxic.**azobisdimethylvaleronitrile.****Properties:** White, crystalline solid.**Use:** Initiator for suspension polymerization of vinyl chloride; solution polymerization of various monomers such as acrylonitrile, MMA, vinyl acetate.**1,1'-azobisformamide.** (azodicarbonamide). $H_2NCONNCONH_2$.**Properties:** Yellow powder. D 1.65 (20/20C), mp above 180C (decomposes). Insoluble in common solvents; soluble in dimethyl sulfoxide. Hydrolyzes at high temperatures to nitrogen, carbon dioxide, and ammonia.**Derivation:** From hydrazine.**Grade:** Technical, FCC.**Use:** Blowing agent for plastics and rubbers, maturing agent for flours.**2,2'-azobisisovaleronitrile.**CAS: 13472-08-7. $C_{10}H_{16}N_4$.**Hazard:** Moderately toxic by ingestion.**azobisisobutyronitrile.** $(CH_3)_2C(CN)NNC(CN)(CH_3)_2$.**Properties:** White powder. Mp 105C (decomposes). Insoluble in water; soluble in many organic solvents and in vinyl monomers.**Hazard:** Toxic by ingestion.**Use:** Catalyst for vinyl polymerizations and for curing unsaturated polyester resins, blowing agent for plastics.**azocarmine dye.** A dye that stains tissues a dark purplish red.**azocholoramid.** (n,n-dichloroazodi carbonamidine).**Properties:** Water-soluble bacteria.**azocyclotin.** See (1h-1,2,4-triazolyl-1-yl)tricyclohexylstannane.**azodicarbonamide.** See 1,1'-azobisformamide.**azodine.** (benzeneazonaphthylethylenediamine).CAS: 136-40-3. $C_{18}H_{18}N_4$.**Properties:** Red crystals. Mp 107–108C.**Use:** Reagent for rapid determination of penicillin in blood, urine, and other media.**Azodrin.** [3-(dimethoxyphosphinyloxy)-n-methyl-cis-crotonamide]; monocrotophos].

CAS: 6923-22-4. Dimethylphosphate of

3-hydroxy-*N*-methyl-*cis*-crotonamide. $(CH_3O)_2P(O)OC(CH_3):CHC(O)NHCH_3$.**Properties:** Reddish-brown solid with a mild ester odor. Bp 125C. Soluble in water and alcohol; almost insoluble in kerosene and diesel fuel. Commercially available as a water-miscible solution.**Hazard:** Flammable, dangerous fire risk. Use may be restricted. Toxic via ingestion, inhalation, and skin absorption. Questionable carcinogen. Cholinesterase inhibitor.**Use:** Controls certain insects which attack cotton plants.**azo dye.** Any of a broad series of synthetic dyes that have $-N=N-$ as a chromophore group. They are produced from amino compounds by diazotization and coupling. Over half of the commercial dyestuffs are in this general category. By varying the chemical composition it is possible to produce acid, basic, direct, or mordant dyes. This general group is subdivided as monoazo, disazo, trisazo, and tetrazo according to the number of $-N=N-$ groups in the molecule. Examples are Chrysoidine Y, Bismarck Brown 2R, and Direct Green B.

See dye, synthetic; azoic dye.

azo dye intermediate. Any of various sulfonated aromatic acids derived from α - and β -naphthol, naphthalene, and α - and β -naphthylamine. Besides their systematic names, some are named after their discoverers, while others have letter designations. All have a fused ring structure with amino, hydroxyl, or sulfonic groups at various locations. For details, see the following entries:

1,2,4-acid	γ acid
amino-G acid	J acid
amino-J acid	Kochs acid
Armstrong's acid	L acid
B acid	Laurent's acid
Broenner' acid	M acid
Casella's acid	Neville-Winter acid
Chicago acid (SS acid)	peri acid
chromotropic acid	R acid
Cleve's acid	R R acid (2R acid)
crocein (Bayer's acid)	Schaeffer's acid
epsilon acid	Schoelkopf's acid
G acid	sultam acid
	Tobias acid

azoic dye. There is no fundamental chromophoric difference between azo and azoic dyes. The differentiation is made to characterize a group of azo pigments which are precipitated within the cellulosic fiber by carrying out the dye coupling on the fiber. With the advent of the equally brilliant but more easily applied fiber-reactive dyes, the azoics have lost some of their importance.

azolitim. A purplish-red colorant.
Derivation: Natural litmus synthesized by oxidation of orcinol in the presence of ammonia, lime, and potash.
Use: Broad indicator of pH.

azophenylene. See phenazine.

Azosal. A series of dyestuffs; soluble in organic solvents.
Use: Coloring spirit lacquers and spirit inks.

azosulfamide. (disodium 2-(4'-sulfamylphenylazo)-7-acetamido-1-hydroxynaphthalene-3,6-disulfonate).
 $C_{18}H_{14}N_4Na_2O_{10}S_3$.
Properties: Dark red powder; odorless; tasteless. Soluble in water with an intense red color; practically insoluble in organic solvents.

Use: Medicine (antibacterial).

azote. The French word for nitrogen (*a* = not, plus *zoo* = alive as in *zoon* = animal). Nitrogen-bearing compounds can be recognized by this root word in such terms as azo, azide, azobenzene, carbazole, thiazole, etc. The derivation is due to the chemical inertness of nitrogen.

azotic acid. See nitric acid.

azoxybenzene. (diphenyldiazeno oxide).
 CAS: 495-48-7. $C_6H_5NO=NC_6H_5$.
Properties: Yellow crystals. D 1.16, mp 36C. Soluble in alcohol; insoluble in water.
Use: Intermediate in organic synthesis.

azoxystrobin.
 CAS: 131860-33-8. $C_{22}H_{17}N_3O_5$.
Hazard: Moderately toxic by inhalation.

azoxytoluidine. See diaminoazoxytoluene.

azulene.
 CAS: 275-51-4. $C_{10}H_7$. Aromatic hydrocarbon with a 7-carbon ring fused to a 5-carbon ring.
Properties: Blue to greenish-black leaflets. Mw 128.19, mp 99–100C, bp 242C, decomposes at 270C, bp 115–135C at 10 mm Hg. Soluble in alcohol, ether, acetone.

azure blue. See cobalt blue.

azuresin.
Properties: Moist, irregular, dark blue or purple granules; slightly pungent odor.
Derivation: Carbacrylic cation-exchange resin, in reversible combination with 3-amino-7-dimethylaminophenazathionium chloride (azure A dye).
 Grade: NF.
Use: Medicine (diagnostic test).