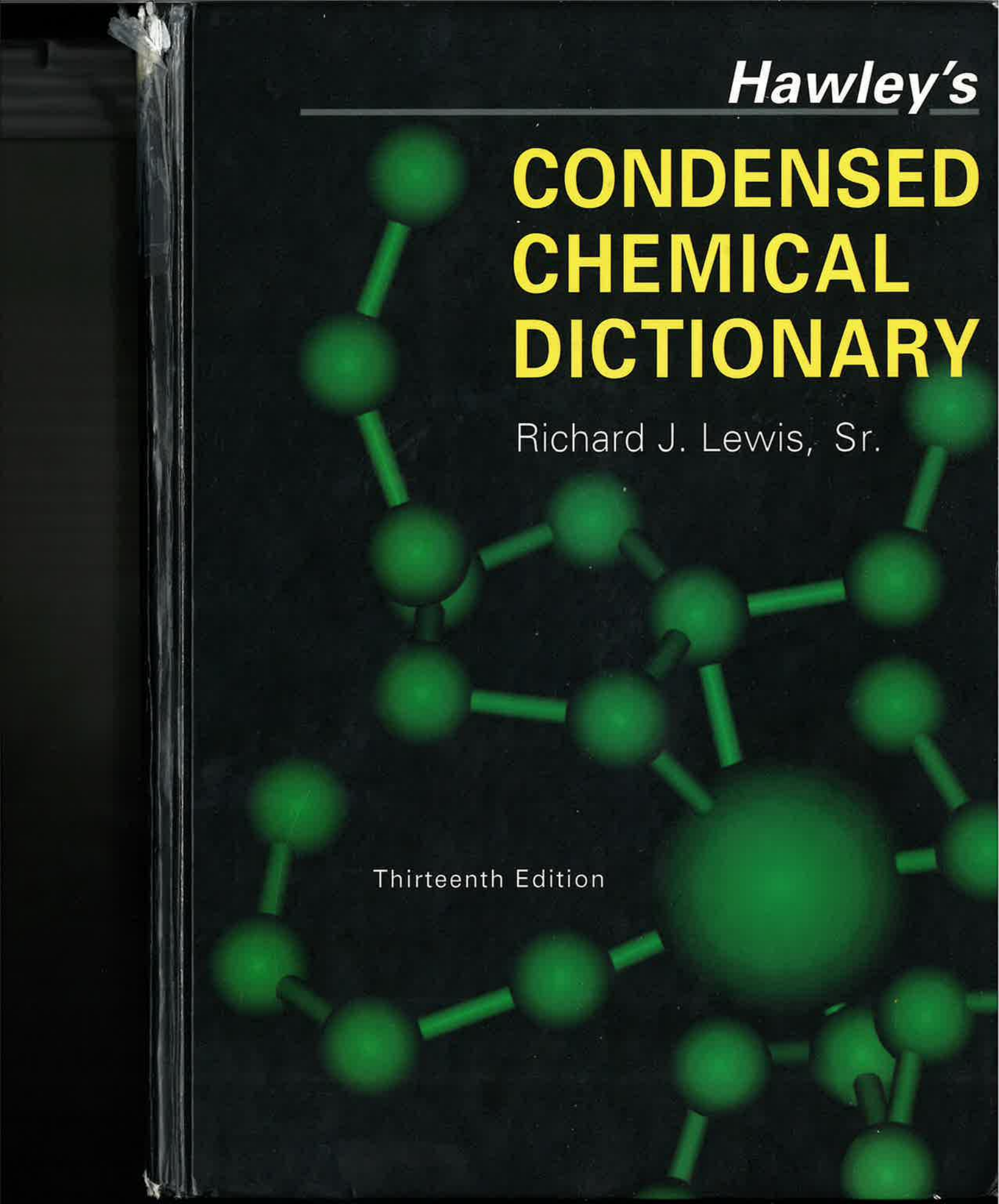
Hawley's

CONDENSED CHEMICAL DICTIONARY

Richard J. Lewis, Sr.



Thirteenth Edition

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Dictionary

THIRTEENTH EDITION

Revised by

Richard J. Lewis, Sr.

VAN NOSTRAND REINHOLD

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Grade: Technical.
Use: Manufacture of dyes, production of lakes, indicators, biological stain.

alizarin blue. (CI 67410). $C_{17}H_9NO_4$.
Properties: Violet crystals. Mp 268C. Insoluble in water, soluble in glacial acetic acid and hot benzene.
Use: Indicator.

alizarin yellow R. (*p*-nitrophenylazosalicylate sodium; C.I. 14030).
$O_2NC_6H_4NNC_6H_3OHCOONa$.
Properties: Yellow-brown powder. Soluble in water.
Use: Acid-base indicator, biological stain.

alkadiene. See diolefin.

alkali. Any substance that 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.

alkali metal. A metal in group IA of the periodic table, i.e., lithium, sodium, potassium, 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 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.

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 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.

alkane. See paraffin (1).

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.

"Alkamuls" ***[Rhone-Poulenec].*** TM for nonyl, octyl, dodecyl, dinonyl, and dianyl phenol ethoxylates.
Use: As primary detergents, emulsifiers, wetting agent, suspending agents, and dispersants in nearly every conceivable application.

calcium formate. $Ca(OOCH)_2$.
Properties: White powder. Mp >300C, d 2.015. Soluble in water; insoluble in alcohol.
Use: Briquet binder, drilling fluids, lubricants, chrome tanning.

calcium gluconate.
CAS: 299-28-5. $Ca(C_6H_{11}O_7)_2 \cdot H_2O$.
Properties: White fluffy powder or granules; odorless; practically tasteless. Stable in air. Loses water at 120C. Soluble in hot water; less soluble in cold water; insoluble in alcohol, acetic acid, and other organic solvents; specific rotation (20/D) approximately +6 degrees. Solution neutral to litmus.
Derivation: Neutralization of gluconic acid with lime or calcium carbonate.
Grade: Technical, USP, FCC, special for ampules.
Use: Food additive, buffer and sequestering agent, vitamin tablets.

calcium glutamate. Similar to sodium glutamate.

calcium glycerophosphate. (calcium glycerinophosphate). $CaC_3H_7O_2PO_4$.
Properties: White, crystalline powder; odorless; almost tasteless. Slightly hygroscopic; decomposes above 170C. Slightly soluble in water; insoluble in alcohol.
Derivation: By esterification of phosphoric acid with glycerol and conversion of glycerophosphoric acid to the calcium salt.
Grade: Technical, pure, FCC.
Use: Stabilizer for plastics, nutrient and dietary supplement.

calcium glycolate. $(CH_3OHCOO)_2Ca$.
Properties: White solid.
Grade: Technical.
Use: Source of glycolic acid and of the glycolic acid radical in chemical synthesis.

calcium hexasilicofluorate. See calcium silicofluoride.

calcium hydrate. See calcium hydroxide.

calcium hydride.
CAS: 7789-78-8. CaH_2.
Properties: Grayish-white lumps or crystals. Forms calcium hydroxide in moist air and evolves hydrogen. D 1.7, decomposes at 675C. Decomposed by water, organic acids, and lower alcohols.
Grade: Technical, 94% pure.
Hazard: Evolves highly flammable hydrogen when wet; solid product is slaked lime. Irritating to skin.
Use: Reducing agent, drying agent, analytical reagent in organic chemistry, easily portable source of hydrogen, cleaner for blocked-up oil wells.

calcium hydrogen sulfite. (calcium bisulfite; calcium dihydrogen sulfite; calcium acid sulfite). $Ca(HSO_3)_2$. A solution of calcium sulfite in aqueous sulfur dioxide.
Properties: Yellowish liquid; strong sulfur dioxide odor. D 1.06. Corrosive to metals.
Derivation: Action of sulfur dioxide on calcium hydroxide (solution).
Hazard: Irritating and corrosive to skin and tissue.
Use: Antichlor in bleaching textiles, paper pulp (dissolving lignin) preservative, bleaching sponges, hydroxylamine salts, germicide, disinfectant.

calcium hydrosulfide. (calcium bisulfide; calcium sulfhydrate). $Ca(HS)_2 \cdot 6H_2O$.
Properties: Colorless, transparent crystals. Soluble in alcohol and water. Decomposes in air (15–18C).
Use: Leather industry.

calcium hydroxide. (calcium hydrate; hydrated lime; caustic lime; slaked lime).
CAS: 1305-62-0. $Ca(OH)_2$.
Properties: Soft, white, crystalline powder; alkaline, slightly bitter taste. D 2.34, loses its water at 580C, pH of water solution (25C) 12.4. Slightly soluble in water; soluble in glycerol, syrup, and acids; insoluble in alcohol. Absorbs carbon dioxide from air.
Derivation: Action of water on calcium oxide.
Impurities: Calcium carbonate, magnesium salts, iron.
Grade: Technical, chemical lime (insoluble matter less than 2%, magnesium less than 3%), building lime, USP, CP, FCC.
Hazard: Skin irritant, avoid inhalation. TLV: 5 mg/m^3 of air.
Use: Mortar, plasters, cements, calcium salts, causticizing soda, depilatory, unhairing of hides, whitewash, soil conditioner, ammonia recovery in gas manufacture, disinfectant, water softening, purification of sugar juices, accelerator for low-grade rubber compounds, petrochemicals, food additive as buffer and neutralizing agent, shell-forming agent (poultry).

calcium hypochlorite. (calcium oxychloride).
CAS: 7778-54-3. $Ca(OCl)_2$.
Properties: White, crystalline solid. D 2.35, decomposes at 100C. Decomposes in water and alcohol; not hygroscopic. Practically clear in water solution. Stable chlorine carrier. An oxidizer.
Derivation: Chlorination of a slurry of lime and caustic soda with subsequent precipitation of calcium hypochlorite dihydrate, dried under vacuum.
Grade: Commercial (70%), high purity (99.2% available chlorine as calcium hypochlorite).
Hazard: Dangerous fire risk in contact with organic materials.
Use: Algicide, bactericide, deodorant, potable-water purification, disinfectant for swimming pools, fungicide, bleaching agent (paper, textiles).
See lime, chlorinated.

calcium hypophosphite. $Ca(H_2PO_2)_2$.

drilling-fluid additive, precipitation of proteins, extender for phenolic plastics, special molded products, source of vanillin, phenol, and of a component of battery expanders.

lignin sulfonate. (lignosulfonate). A metallic sulfonate salt made from the lignin of sulfite pulp-mill liquors, mw range 1000–20,000.
Properties: Light-tan to dark-brown powder; no pronounced odor. Stable in dry form and relatively stable in aqueous solution. Nonhygroscopic, no definite mp, decomposes above 200C, d about 1.5. Forms colloidal solutions or dispersions in water; practically insoluble in all organic solvents.
Use: Dispersing agent in concrete and carbon black–rubber mixes, extender for tanning agents, oil-well drilling mud additives, ore flotation agents, production of vanillin, industrial cleaners, gypsum slurried, dyestuffs, pesticide formulations. Commercially available as the salts of most metals and of ammonium.
See "Raykrome" *[Rayonier]*.

lignite. (brown coal). A low rank of coal between peat and subbituminous; it contains 35–40% water. It occurs in the continental U.S., Alaska, Germany and the Netherlands. Its Btu value is low. Drying, crushing, and pelletizing lignite with an asphaltic binder for direct use as fuel has been successfully demonstrated. Polymer resins (polyesters and polyamides) can be derived from lignite by oxidation with nitric acid, followed by extraction of the nitrocoal acids, which are the basis of the polymer molecules. Peat can also be used. A process for gasification of lignite to produce methanol alcohol is approaching commercial development in Sweden.
See peat; gasification.

lignoceric acid. (*n*-tetracosanoic acid). $CH_3(CH_2)_{22}COOH$. A long-chain saturated fatty acid found in minor quantities in most natural fats.
Properties: Crystals. Mp 84.2C, bp 272C (10 mm Hg), d 0.8207, refr index 1.4287 (100C). Nearly insoluble in ethanol.
Source: Lignite and beechwood tar, peanut oil, sphingomyelin.
Grade: Technical, 99%.
Use: Biochemical research.

lignosulfonate. See lignin sulfonate.

ligroin. A saturated volatile fraction of petroleum boiling in the range 60–110C. There is a special grade of ligroin known as petroleum benzin.
Hazard: Highly flammable, dangerous fire risk. Toxic by ingestion and inhalation.
Use: Solvent for resins, paints, varnishes, etc.

lime. Fifth highest-volume chemical produced in U.S. (1995). Over 41 billion pounds were produced in 1995. Specifically, calcium oxide (CaO); more generally, any of the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime (adapted from ASTM definition C41-47). Noncombustible. For further information, see National Lime Association, 925 16th St. N.W., Washington, DC 20036.
Hazard: Unslaked lime (quicklime) yields heat on mixing with water and is a caustic irritant.
Use: See calcium oxide, calcium hydroxide.
See calcium oxide.

lime acetate. See calcium acetate.

lime, agricultural. Lime slaked with a minimum amount of water to form calcium hydroxide.

lime, air-slaked. Lime that has absorbed carbon dioxide and moisture from the atmosphere. It consists of a powder composed of calcium carbonate and calcium hydroxide.

lime, chlorinated. (chloride of lime; bleaching powder). $CaCl(ClO)\cdot 4H_2O$
Properties: White powder; chlorine odor. Mp (decomposes). Decomposes in water, acids.
Derivation: By conducting chlorine into a boxlike structure containing slaked lime spread upon perforated shelves.
Grade: 35–37% active chlorine, technical.
Hazard: Evolves chlorine and, at higher temperatures, oxygen. With acids or moisture evolves chlorine freely at ordinary temperatures.
Use: Textile and other bleaching applications, organic synthesis, deodorizer, disinfectant.
See calcium hypochlorite; bleach.

lime citrate. See calcium citrate.

lime, fat. A pure lime that combines readily with water to form a fine, white powder, free from grit, and makes a smooth, stiff paste with excess of water. Must not be loaded hot.
See lime, lean.

lime, hydrated. See calcium hydroxide.

lime, hydraulic. A variety of calcined limestone that when pulverized absorbs water without swelling or heating and gives a cement that hardens under water. The limestone burned for this purpose usually contains 10–17% silica, alumina, and iron, and 40–45% lime, magnesia sometimes replacing lime. Must not be loaded hot.

lime hypophosphite. See calcium hypophosphite.

lime, lean. A lime that does not lake freely with water because it has been prepared from limestone containing a high percentage of impurities, e.g., silica, iron, alumina, etc. Must not be loaded hot.

lime-nitrogen. See calcium cyanamide.

lime oil, distilled.
CAS: 8008-26-2. Colorless to greenish-yellow, volatile oil obtained by distillation from the juice or whole crushed fruit of *Citrus aurantifolia* Swingle.
Properties: Refr index 1.4745–1.4770 (20C), d 0.855–0.863 (25C), angular rotation +34 to +47 degrees. Soluble in most fixed oils and mineral oil; insoluble in glycerol and propylene glycol. Combustible.
Chief constituents: Terpineol, citral.
Grade: FCC (contains between 0.5 and 2.5% of aldehydes, calculated as citral).
Use: Extracts, flavoring, perfumery, toilet soaps, cosmetics.

lime oil, expressed. See citrus peel oil.

lime saltpeter. See calcium nitrate.

lime, slaked. See calcium hydroxide.

limestone.
CAS: 1317-65-3. $CaCO_3$. A noncombustible solid characteristic of sedimentary rocks and composed mainly of calcium carbonate in the form of the mineral calcite, Mohs hardness about 3. Limestones are sometimes classed according to the impurities contained. For example, dolomitic limestone: usually a limestone containing more than 5% magnesium carbonate; magnesium limestone: dolomitic limestone, used as a solid diluent and carrier in pesticides; argillaceous limestone: contains clays, used in cement manufacture as "cement rock"; siliceous limestone: a limestone containing sand or quartz. Limestones are also named according to the formation in which they occur.
See marble; dolomite.
Use: Building stone, metallurgy (flux), manufacture of lime, source of carbon dioxide, agriculture, road ballast, cement (Portland and natural), alkali manufacture, removal of sulfur dioxide from stack gases and sulfur from coal.

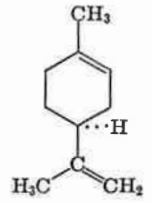
lime, sulfurated. (calcium sulfide, crude). A mix of calcium sulfide and calcium sulfate.
Properties: Yellowish-gray or grayish-white powder; odor of hydrogen sulfide. Soluble in acids; insoluble in water and alcohol. Noncombustible.
Derivation: By roasting calcium sulfate with coke.
Use: Medicine, depilatory, luminous paint.

lime-sulfur solution. A solution made by boiling together lime (50 lb), sulfur (100 lb), and water (100 gal) and diluting to one-tenth strength. Contains calcium polysulfide, free sulfur, and calcium thiosulfate.
Use: Fungicidal spray on fruit trees, sheep dip.

lime, unslaked. See calcium oxide.

lime water. (calcium hydroxide solution).
CAS: 1305-62-0.
Properties: Clear, colorless, odorless, alkaline aqueous solution of calcium hydroxide containing more than 0.14 g of $Ca(OH)_2$ in each 100 mL at 25C (the strength varies with the temperature at which the solution is stored), d about 1.00 (25C), absorbs carbon dioxide from air.
Grade: USP (as calcium hydroxide solution).
Use: Medicine (external).

limonene.
CAS: 138-86-3. $C_{10}H_{16}$. A widely distributed, optically active terpene, closely related to isoprene. It occurs naturally in both *d*- and *l*-forms. The racemic mixture of the two isomers is known as dipentene.



Properties: Colorless liquid. (1) D 0.8411 (20C), bp 176–176.4C; (2) d 0.8422 (20C), bp 176–176.4C. Oxidizes to a film in air, oxidation behavior similar to that of rubber or drying oils.
Derivation: (1) Lemon, bergamot, caraway, orange, and other oils, (2) peppermint and spearmint oils.
Use: Flavoring, fragrance and perfume materials, solvent, wetting agent, resin manufacture.

limonene dioxide. See dipentene dioxide.

limonene, inactive. (or racemic or dl). See dipentene.

limonene monoxide. See dipentene monoxide.

linalool. (linalol; 3,7-dimethyl-1,6-octadien-3-ol).
CAS: 78-70-6.
$(CH_3)_2C{:}CHCH_2CH_2C(CH_3)OHCH{:}CH_2$.
Linalool is the *l*-isomer, coridandrol is the *d*-isomer.
Properties: Colorless liquid; odor similar to that of bergamot oil and French lavender. D 0.858–0.868 (25C), bp 195–199C, angular rotation −2 to +2 degrees. Soluble in alcohol, ether, fixed oils. Combustible.
Derivation: Citrus peel oils, especially from oranges. Made synthetically from geraniol.
Method of purification: Rectification.
Grade: Ex bois de rose oil, synthetic, FCC.
Use: perfumery, flavoring agent.

linalool oxide. (tetrahydro-α,α-5-trimethyl-5-vinylfurfuryl alcohol). $C_{10}H_{17}O_2$.
Properties: Liquid. Refr index 1.4523 (20C).
Derivation: Synthetically from acetone.
Use: Perfuming and flavoring agent.