The Condensed Chemical Dictionary

NINTH EDITION

Revised by

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VAN NOSTRAND REINHOLD COMPANY
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impregnating adhesives and glues for furniture, plywood and aircraft; hot and cold pressing; radio frequency equipment; molding of diversified components from granulated wood.

"Lava." Trademark for synthetic block talc or soapstone used in electron tubes and other devices as an insulator.

lavandin oil, abrial. Essential oil obtained by steam distillation of plant material of a hybrid of true lavender and spike lavender, lavandula abrialis.
Properties: Yellow liquid with camphoraceous odor which is suggestive of lavender. Sp. gr. 0.885–0.893 (25°C); refractive index 1.4605–1.4640 (20°C). Soluble in most fixed oils, propylene glycol and mineral oil; relatively insoluble in glycerol.
Grades: Sold on basis of ester content. F.C.C. requires 28–35% ester calculated as linalyl acetate.
Uses: Perfumery; flavoring agent.

lavender oil.
Properties: Essential oil; colorless, yellowish or greenish-yellow; sweet odor; slightly bitter taste. Sp. gr. 0.875–0.888 (25°C); refractive index 1.4590–1.4700 (20°C); angular rotation −3 to −10°; one volume oil dissolves in 4 volumes 70% alcohol. Combustible; nontoxic.
Chief constituents: Linalool; linalyl acetate; geraniol; pinene; limonene; cineol.
Derivation: Steam-distilled from the fresh flowering tops of Landula officinalis.
Grades: N.F.; F.C.C. Both require not less than 35% of esters, calculated as linalyl acetate.
Uses: Perfumery; flavoring agent.

lavender oil, terpeneless
Concentration: About 1.75–2 times that of natural lavender oil. Sp. gr. 0.893–0.898; optical rotation, about −5°. Solubility in alcohol: 15 parts per 100 parts of 60% alcohol; 55 parts per 100 parts of 70% alcohol.

lavender-spike oil. See spike oil.

"Lavenol."[188] Trademark for a series of synthetic lavender oil substitutes of various types.

Lavoisier, Antoine Laurent (1743–1794). French chemist generally regarded as the "father" of chemistry. His "Traité Elementaire de Chimie" (1789) listed 30 elements, clarified the nomenclature of acids, bases and salts, and described the composition of numerous organic substances. He erroneously believed that oxygen is the characteristic element of acids. However, his fundamental work on combustion, as a result of which he identified and named nitrogen (azote), and on the separation of hydrogen from water by a unique reduction experiment carried out in a heated gun barrel, earned him a leading position among early chemists. (See also Mendeleéf).

"Lavol."[188] Trademark for a substitute for linalyl acetate.

lawrencium Lr A synthetic radioactive element with atomic number 103, discovered in 1961. Atomic weight 257. Only one other isotope is known (256). The 257 isotope has a half-life of 8 seconds. It has been made by bombarding californium with boron ions. It exhibits alpha radiation. See actinide series.

LC_{50} (lethal concentration, 50%). That quantity of a substance administered by inhalation that is necessary to kill 50% of test animals exposed to it within a specified time. This test applies not only to gases and vapors but to fume, dusts and other particulates suspended in air.

L.C.L. Abbreviation for "less than carload lot"; used by shippers, traffic managers, railroads, etc.

LD_{50} (lethal dose, 50%). That quantity of a substance administered either orally or by skin contact necessary to kill 50% of exposed animals in laboratory tests within a specified time.

leaching. See solvent extraction.

lead Pb (from Latin plumbum). Metallic element of atomic number 82, Group IVA of the periodic table. Atomic weight 207.2; valences 2, 4; 4 stable isotopes. The isotopes are the end products of the three series of natural radioactive elements uranium (206), thorium (208), and actinium (207).
Properties: Heavy, ductile, soft gray solid. Sp. gr. 11.35; m.p. 327.4°C; b.p. 1755°C; soluble in dilute nitric acid; insoluble in water but dissolves slowly in water containing a weak acid; resists corrosion; relatively impenetrable to radiation. Poor electrical conductor; good sound and vibration absorber. Noncombustible.
Occurrence: U.S., Mexico, Canada, S. America, Australia, Africa, Europe.
Derivation: Roasting and reduction of galena (lead sufide), anglesite (lead sulfate), and cerussite (lead carbonate). Also from scrap.
Purification method: Desilvering (Parkes process); electrolytic refining (Betts process); pyrometallurgical refining (Harris process). Bismuth is removed by Betterton-Kroll process.
Grades: High purity (less than 10 ppm impurity); pure (99.9+); powdered (99% pure); pig lead; paste.
Forms available: Ingots, sheet, pipe, shot, buckles or straps, grids, rod, wire, etc.; paste; powder; single crystals.
Hazard: Toxic by ingestion and inhalation of dust or fume. Tolerance (lead, fumes and dusts, and inorganic compounds) 0.15 mg per cubic meter of air. A cumulative poison. FDA regulations require zero lead content in foods and 0.05% in house paints.
Uses: Storage batteries; tetraethyllead (gasoline additive); radiation shielding; cable covering; ammunition; sheet and pipe; solder and fusible alloys; type metal; vibration damping in heavy construction; foil; numerous alloys.
For further information refer to Lead Industries Association, 292 Madison Ave., New York.

lead acetate (sugar of lead) $Pb(C_2H_3O_2)_2 \cdot 3H_2O$. – Batteles
Properties: White crystals or flakes (commercial grades are frequently brown or gray lumps). Sweetish taste. Absorbs carbon dioxide when exposed to air, becoming insoluble in water. Soluble in water; slightly soluble in alcohol; freely soluble in glycerol. Sp. gr. 2.50; m.p. loses H_2O at 75°C; at 200°C decomposes; b.p. (anhydrous) 280°C. Combustible.
Derivation: By the action of acetic acid on litharge or thin lead plates.
Grades: Powdered; granular; crystals; flakes; C.P.
Containers: Multiwall paper sacks; drums; carloads.
Uses: Medicine; lead salts; dyeing of textiles; waterproofing; varnishes; lead driers; chrome pigments; gold cyanidation process; insecticide; antifouling paints; analytical reagent.
Hazard: Highly toxic by ingestion, inhalation, skin absorption. Absorbed by skin. Use may be restricted.
Shipping regulations: (Air) Poison label.

lead alkyl, mixed. A mixture containing various methyl and ethyl derivatives of tetraethyl lead and tetramethyl lead. Thus methyl triethyl lead, dimethyl diethyl lead and ethyl trimethyl lead may all be present with or without tetraethyl and tetramethyl lead.
Hazard: Toxic by ingestion and skin absorption.
Uses: Antiknock agents in aviation gasoline.

lead antimonate (Naples yellow; antimony yellow) $Pb_3(SbO_4)_2$.
Properties: Orange-yellow powder. Insoluble in water. Sp. gr. 6.58 (20°C). Noncombustible.
Derivation: Interaction of solutions of lead nitrate and potassium antimonate, concentratoin and crystallization.
Hazard: Toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Staining glass, crockery and porcelain.

lead arsenate (lead orthoarsenate) $Pb_3(AsO_4)_2$.
Properties: White crystals. Soluble in nitric acid; insoluble in water; sp. gr. 7.80; m.p. 1042°C (decomposes).
Derivation: By the action of a soluble lead salt on a solution of sodium arsenate, concentration and crystallization.
Uses: Insecticide; herbicide.
Hazard: Highly toxic. Tolerance, 0.15 mg per cubic meter of air.
Shipping regulations: (Rail, Air) Poison label.

lead arsenite $Pb(AsO_2)_2$.
Properties: White powder; soluble in nitric acid; insoluble in water. Sp. gr. 5.85.
Hazard: Highly toxic.
Use: Insecticide.
Shipping regulations: (Rail, Air) Poison label.

lead azide $Pb(N_3)_2$.
Properties: Colorless needles; an initiating explosive. Should always be handled submerged in water.
Derivation: Reaction of sodium azide with a lead salt.
Hazard: Severe explosion risk; detonates at 350°C (660°F). Highly toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: Primary detonating compouind for high explosives.
Shipping regulations: (Air) Not accepted. (Rail) Consult regulations. Not accepted by express.
Note: Explosions have occurred in cases where azide compounds have reacted with the lead in plumbing after being washed down sinks.

lead-base Babbitt. See Babbitt metal.

lead biorthophosphate. See lead phosphate, dibasic.

lead, blue. A term applied to galena to distinguish it from white lead ore. It is also applied to blue basic lead sulfate.

lead borate $Pb(BO_2)_2 \cdot H_2O$.
Properties: White powder. Soluble in dilute nitric acid; insoluble in water. Sp. gr. 5.598; m.p. 160°C (loses water). Noncombustible.
Derivation: Interaction of solutions of lead hydroxide and boric acid, with subsequent crystallization.
Hazard: Highly toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Varnish and paint drier; waterproofing paints; lead glass; galvanoplastic products.

lead borosilicate. A constituent of optical glass, composed of a mixture of the borate and silicate of lead.

lead bromate $Pb(BrO_3)_2 \cdot H_2O$.
Properties: Colorless crystals. Soluble in hot water; sp. gr. 5.53; decomposes at about 180°C.

lead bromide $PbBr_2$.
Properties: White powder. Slightly soluble in hot water; insoluble in alcohol. Sp. gr. 6.66; b.p. 916°C; m.p. 373°C.
Hazard: Highly toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.

lead carbolate. See lead phenate.

lead carbonate $PbCO_3$. See lead carbonate, basic.
Properties: White, powdery crystals. Soluble in acids; insoluble in water and alcohol. Sp. gr. 6.6; decomposed by heat 315°C. Noncombustible.
Derivaton: By adding a solution of sodium bicarbonate to a solution of lead nitrate. Occurs in nature as cerussite.
Hazard: Toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.
Impurities: Basic lead carbonate.
Use: Industrial paint pigment.

lead carbonate, basic (lead subcarbonate; white lead; BCWL; lead flake) $2PbCO_3 \cdot Pb(OH)_2$.
Properties: White, amorphous powder. Soluble in acids; insoluble in water; decomposes at 400°C; sp. gr. 6.86. Noncombustible.
Derivation: (a) Dutch process. By the corrosion of lead buckles in pots by acetic acid and carbon dioxide generated by the fermentation of waste tanbark. (b) Carter process. By treating very finely divided lead in revolving wooden cylinders with dilute acetic acid and carbon dioxide.
Hazard: Toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Industrial paint pigment; putty; ceramic glazes.

lead chloride $PbCl_2$.
Properties: White crystals. Slightly soluble in hot water; insoluble in alcohol and cold water. Sp. gr. 5.88; m.p. 498°C; b.p. 950°C. Noncombustible.
Derivation: By the addition of hydrochloric acid or sodium chloride to a solution of a lead salt, with subsequent crystallization.
Hazard: Toxic by inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Preparation of lead salts; lead chromate pigments; analytical reagent.

lead chlorosilicate complex. See "Lectro" 60.

lead chromate. $PbCrO_4$.
Properties: Yellow crystals. Soluble in strong acids and alkalies; insoluble in water. Sp. gr. 6.123; m.p. 844°C.
Derivation: Reaction of sodium chromate and lead nitrate in solution.
Hazard: Toxic by ingestion and inhalation. May be a carcinogen. Tolerance, 0.1 mg per cubic meter of air.
Uses: Pigment in industrial paints, rubber, plastics, ceramic coatings.
See also chrome pigment.

lead coating. Coatings of lead or lead-rich alloys are (1) deposited by dipping into the molten metal, after applying a layer of tin to secure good adhesion of the lead coating; (2) by electroplating from a fluosilicate or fluoborate bath, or (3) by spraying.

lead cyanide $Pb(CN)_2$.
Properties: White to yellowish powder. Slightly soluble in water; decomposes in acid.
Derivation: Interaction of solutions of potassium cyanide and lead acetate.

Hazard: Highly toxic by ingestion, inhalation, and skin absorption. Tolerance (as CN), 5 mg per cubic meter of air.
Use: Metallurgy.
Shipping regulations: (Rail, Air) Poison label.

lead dimethyldithiocarbamate $Pb[SCSN(CH_3)_2]_2$.
Properties: White powder; sp. g. 2.43 ± .03; melting range 310°C; insoluble in all common organic solvents; slightly soluble in cyclohexanone.
Use: Vulcanization accelerator with litharge.

lead dioxide (lead oxide, brown; plumbic acid, anhydrous; lead peroxide; lead superoxide) PbO_2.
Properties: Brown, hexagonal crystals. Soluble in glacial acetic acid; insoluble in water and alcohol; sp. gr. 9.375; m.p. 290°C (dec). An oxidizing agent.
Derivation: By adding bleaching powder to an alkaline solution of lead hydroxide.
Hazard: Toxic. Dangerous fire risk in contact with organic materials. Tolerance, 0.15 mg per cubic meter of air.
Uses: Oxidizing agent; electrodes; lead-acid storage batteries; curing agent for polysulfide elastomers; textiles (mordant, discharge in dyeing with indigo); matches; explosives; analytical reagent.
Shipping regulations: (Rail) Oxidizing material, n.o.s., Yellow label. (Air) Oxidizer label.

lead dross (lead scrap). Consists of the scrap, dross, or waste from sulfuric acid tanks; a mixture of metallic lead, lead sulfate, and free sulfuric acid.

lead, electrolytic. Pure lead obtained by electrolytic deposition. See Betts process.

"Lead/Epox."[504] Trademark for a two-component shielding material designed to be formed after mixing. It is then a putty-like high-density material which can be used as a mortar. No. 250 consists of 94.5 wt.% lead, 5.5 wt.% epoxy resin, for protection against gamma rays. No. 251 consists of 93.8 wt.% lead, 5.7 wt.% epoxy resin and 0.5 wt.% boron.

lead ethylhexoate. See "L-26."

lead flake. See lead carbonate, basic.

lead fluoride PbF_2.
Properties: Crystalline solid; density 8.2 g/cc; m.p. (approx) 824°C; very slightly soluble in water. Noncombustible.
Grade: Crystal, 99.93%.
Hazard: Highly toxic; strong irritant. Tolerance, 0.15 mg per cubic meter of air.
Uses: Electronic and optical applications; starting materials for growing single crystal solid-state lasers; high temperature dry film lubricants in the form of ceramic-bonded coatings.

lead fluosilicate (lead silicofluoride) $PbSiF_6 \cdot 2H_2O$.
Properties: Colorless crystals; soluble in water; decomposes when heated.
Hazard: Highly toxic; strong irritant. Tolerance, 0.15 mg per cubic meter of air.
Use: Solution for electrorefining lead.

lead formate $Pb(CHO_2)_2$.
Properties: Brownish-white, lustrous, very finely divided, crystalline substance; sp. gr. 4.63; soluble to water. Decomposes at 190°C. Noncombustible.
Hazard: Highly toxic.
Use: Reagent in analytical determinations.

lead fumarate, tetrabasic. See "Lectro" 78.

lead glass. See glass.

lead hydroxide (lead hydrate; hydrated lead oxide) $Pb(OH)_2$ or $Pb_2O(OH)_2$.
Properties: White, bulky powder. Soluble in alkalies; slightly soluble in water; soluble in nitric and acetic acid; sp. gr. 7.592; m.p., decomposes at 145°C; absorbs carbon dioxide from air. Noncombustible.
Derivation: By the addition of sodium or ammonium hydroxide to a solution of a lead salt with subsequent filtration and drying.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: Lead salts; lead dioxide.

lead hyposulfite. See lead thiosulfate.

lead iodide PbI_2.
Properties: Golden-yellow crystals or powder; odorless. Soluble in potassium iodide and concentrated sodium acetate solutions; insoluble in water and alcohol; sp. gr. 6.16; m.p. 402°C; b.p. 954°C. Noncombustible.
Derivation: Interaction of lead acetate and potassium iodide.
Hazard: Tolerance, 0.15 mg per cubic meter of air.
Uses: Bronzing; mosaic gold; printing; photography; cloud seeding.

lead linoleate (lead plaster) $Pb(C_{18}H_{31}O_2)_2$.
Properties: Yellowish-white paste. Soluble in oils; insoluble in water. Combustible.
Derivation: By heating a solution of lead nitrate with sodium linoleate.
Grades: Technical; fused (contains 26.5% Pb).
Hazard: Toxic; absorbed by skin.
Uses: Medicine; drier in paints and varnishes.

lead maleate, tribasic.
Properties: Soft, yellowish white crystalline powder; sp. gr. 6.3; refractive index 2.08.
Hazard: Toxic; absorbed by skin.
Uses: Vulcanizing agent for chlorosulfonated polyethylene. Highly basic stabilizer with high heat stability in vinyls.

lead metavanadate. See lead vanadate.

lead molybdate $PbMoO_4$.
Properties: Yellow powder. Soluble in acids; insoluble in water and alcohol. Absolute density 5.9 g/cc; m.p. 1060–1070°C. Noncombustible.
Derivation: By adding a solution of lead nitrate to a solution of ammonium molybdate, concentration and crystallization.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Analytical chemistry; pigments (see molybdate oranges). Single crystals available for electronic and optical uses.

lead monohydrogen phosphate. See lead phosphate, dibasic.

lead mononitroresorcinate $PbO_2C_6H_3NO_2$.
Hazard: An initiating explosive; dangerous.
Shipping regulations: (Rail, Air) Not accepted.

lead monoxide. See litharge; massicot.

lead beta-naphthalenesulfonate $Pb(C_{10}H_7SO_3)_2$.
Properties: White crystalline powder. Soluble in alcohol; insoluble in water. Combustible.
Derivation: By the action of lead acetate on beta-naphthalenesulfonic acid.

Hazard: Toxic. Absorbed by skin.
Use: Organic preparations.

Paint Lube Oil

lead naphthenate.
Properties: Soft, yellow, resinous semi-transparent. Gives deposits in highly acid oils, but not when mixed with suitable quantities of cobalt or manganese. Soluble in alcohol; m.p. approx. 100°C. Combustible.
Derivation: Addition of lead salt to aqueous sodium naphthenate solution.
Grades: Liquid: 16%, 24% Pb; solid: 37% Pb.
Containers: Steel drums; fiber drums.
Hazard: Toxic. Absorbed by skin.
Uses: Paint and varnish drier; wood preservative; insecticide; catalyst for reaction between unsaturated fatty acids and sulfates in the presence of air; lube oil additive.
See also soap (2).

Paint Photo litho

lead nitrate $Pb(NO_3)_2$.
Properties: White crystals. Soluble in water and alcohol; sp. gr. 4.53; decomposes at 470°C.
Derivation: By the action of nitric acid on lead.
Hazard: Toxic. Strong oxidizing material. Dangerous fire risk in contact with organic materials. Tolerance, 0.15 mg per cubic meter of air.
Uses: Lead salts; mordant in dyeing and printing calico; matches; paint pigment; mordant for staining mother-of-pearl; oxidizer in the dye industry; sensitizer in photography; explosives; tanning; process engraving and lithography.
Shipping regulations: (Rail) Yellow label. (Air) Oxidizer label.

lead nitrite (basic lead nitrite; lead subnitrite).
Properties: Light-yellow powder; variable composition, essentially $3PbO \cdot N_2O_3 \cdot H_2O$. Soluble in dilute nitric acid. Easily decomposed.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.

lead ocher. See massicot (1).

lead octoate. See soap (2).

Paint

lead oleate $[CH_3(CH_2)_7CH{:}CH(CH_2)_7COO]_2Pb$.
Properties: White powder or ointment-like granules or mass. Soluble in alcohol, ether, turpentine, and benzene; insoluble in water. Combustible.
Derivation: Reaction of oleic acid with lead hydrate or carbonate, or of lead acetate and sodium oleate.
Hazard: Toxic; absorbed by skin.
Uses: Varnishes; lacquers; paint drier; high-pressure lubricants.
See also soap (2).

lead orthoarsenate. See lead arsenate.

lead orthophosphate, normal. See lead phosphate.

lead orthosilicate. See lead silicate.

lead oxide, black. See lead suboxide.

lead oxide, brown. See lead dioxide.

lead oxide, hydrated. See lead hydroxide.

lead oxide, red (red lead; minium; plumboplumbic oxide) Pb_3O_4.
Properties: Bright red powder; partly soluble in acids; insoluble in water. Sp. gr. reported variously 8.32–9.16; decomposes between 500 and 530°C. An oxidizing agent; may react with reducing agents.
Derivation: By carefully heating litharge in a furnace in a current of air.
Grades: Technical; 95%, 97%, 98%.
Hazard: Toxic as dust. Tolerance, 0.15 mg per cubic meter of air. Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.
Uses: Storage batteries; glass; metal-protective paints; pottery and enameling; varnish; purification of alcohol; packing pipe joints.

lead oxide, yellow. See litharge.

lead perchlorate $Pb(ClO_4)_2 \cdot 3H_2O$. White crystals; sp. gr. 2.6; m.p. 100°C (dec). Very soluble in cold water; soluble in alcohol.
Hazard: Toxic; dangerous in contact with organic materials. Strong oxidizing agent.
Shipping regulations: (Rail) Perchlorates n.o.s., Yellow label. (Air) Oxidizer label.

lead peroxide. See lead dioxide.

lead phenate (lead phenolate; lead carbolate) $Pb(OH)OC_6H_5$.
Properties: Yellowish to grayish-white powder. Soluble in nitric acid; insoluble in water and alcohol.
Derivation: By boiling phenol with litharge.
Hazard: Toxic; absorbed by skin.

lead phenolsulfonate (lead sulfocarbolate) $Pb(C_6H_4OHSO_3)_2 \cdot 5H_2O$.
Properties: White crystals or powder. Soluble in water and alcohol.
Hazard: Toxic; absorbed by skin.

lead phosphate (normal lead orthophosphate) $Pb_3(PO_4)_2$.
Properties: White powder; sp. gr. 6.9–7.3; m.p. 1014°C. Insoluble in water; soluble in acids and alkalies.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.

lead phosphate, dibasic (lead monohydrogen phosphate; lead biorthophosphate) $PbHPO_4$.
Properties: Soft white powder of fine plate-like crystals; sp. gr. 5.66 (15°C); m.p., decomposes.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Imparting heat resistance and pearlescence to polystyrene and casein plastics.

lead phosphite, dibasic $2PbO \cdot PbHPO_3 \cdot \frac{1}{2}H_2O$.
Properties: Fine white acicular crystals; sp. gr. 6.94; refractive index 2.25. Insoluble in water.
Containers: 40-, 350-lb fiber drums.
Uses: Heat and light stabilizer for vinyl plastics and chlorinated paraffins. As an ultraviolet screening and antioxidizing stabilizer for vinyl and other chlorinated resins in paints and plastics.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air. Store in closed containers, away from open flame or sparks and at temperatures not to exceed 400°F.
Shipping regulations: (Rail, Air) Not listed. Consult authorities.

lead phthalate, dibasic $C_6H_4(COO)_2Pb \cdot PbO$.
Properties: Fluffy, white crystalline powder; insoluble in water; sp. gr. 4.5; refractive index 1.99 (av.).
Derivation: By boiling litharge with phthalic acid.
Hazard: Toxic. Absorbed by skin.
Use: Heat and light stabilizer for general vinyl use.

lead plaster. See lead linoleate.

lead protoxide. See litharge.

lead, red. See lead oxide, red.

lead resinate $Pb(C_{20}H_{29}O_2)_2$.
Properties: Brown lustrous translucent lumps or yellow-white powder, or yellowish-white paste. Insoluble in most solvents. Combustible.
Derivation: By heating a solution of lead acetate and rosin oil.
Grades: Precipitated, 23% Pb.
Hazard: Toxic; absorbed by skin.
Uses: Paint and varnish drier; textile water-proofing agent.

lead salicylate $Pb(OOCC_6H_4OH)_2 \cdot H_2O$.
Properties: Soft, creamy white crystalline powder; sp. gr. 2.3; refractive index 1.78; soluble in hot water and alcohol. Combustible.
Hazard: Probably toxic.
Uses: Stabilizer or costabilizer for flooring and other vinyl compounds requiring good light stability.

lead selenide PbSe. Gray crystals; sp. gr. 8.10 (15°C); m.p. 1065°C. Insoluble in water; soluble in nitric acid. A semiconductor used in infrared detectors and thermoelectric devices.
Hazard: Toxic. Moderate fire hazard as dust or in presence of moisture. Tolerance, 0.15 mg per cubic meter of air.

lead sesquoxide Pb_2O_3.
Properties: Reddish-yellow powder. Soluble in alkalies and acids; insoluble in water. Decomposes at 370°C.
Derivation: By gently heating metallic lead.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Medicine; ceramics; ceramic cements; metallurgy; varnishes.

lead silicate (lead metasilicate) $PbSiO_3$. (?)
Properties: White, crystalline powder; insoluble in most solvents. Noncombustible.
Derivations: Interaction of lead acetate and sodium silicate.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Ceramics; fireproofing fabrics.

lead silicate, basic (white lead silicate; lead silicate sulfate). A pigment made up of an adherent surface layer of basic lead silicate and basic lead sulfate cemented to silica.
Properties: Excellent film-forming properties with drying oils combined with low specific gravity.
Derivation: Fine silica is mixed with litharge and sulfuric acid. The mixture is then furnaced in a rotary kiln and ground to break up agglomerates.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: Pigment in industrial paints.

lead silicochromate. Any of a group of yellow pigments. Normal lead silicon chromate is used as a yellow prime pigment for traffic marking paints. Basic lead silicon chromate is used as a corrosion inhibitive pigment for metal protective coatings, primers and finishes. Also for industrial enamels requiring a high gloss.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.

lead silicofluoride. See lead fluosilicate.

lead-silver Babbitt. See Babbitt metal.

lead-soap lubricants. Lead salts saponified with fats; hard at low temperatures, viscous at medium temperatures, but become somewhat fluid on heating by friction. Used as "extreme-pressure lubricants," but are not suited for high-speeds.
See lead naphthenate; lead oleate; lead stearate; also soap (2).

lead sodium hyposulfite. See lead sodium thiosulfate.

lead sodium thiosulfate (lead sodium hyposulfite; sodium lead hyposulfite; sodium lead thiosulfate) $PbS_2O_3 \cdot 2Na_2S_2O_3$.
Properties: Heavy, small, white crystals. Soluble in solutions of thiosulfates.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: Matches.

lead stannate $PbSnO_3 \cdot 2H_2O$.
Properties: Light-colored powder. Insoluble in water. Approximate temperature of dehydration 170°C.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Additive in ceramic capacitors; pyrotechnics.

"Leadstar."[304] Trademark for normal lead stearate.

lead stearate $Pb(C_{18}H_{35}O_2)_2$.
Properties: White powder; m.p. 100–115°C; sp. gr. 1.4; soluble in ether; insoluble in alcohol; slightly soluble in water. Combustible.
Derivation: By heating a solution of lead acetate with sodium stearate.
Hazard: Toxic; absorbed by skin.
Uses: Varnish and lacquer drier; high-pressure lubricants; lubricant in extrusion processes; stabilizer for vinyl polymers; corrosion inhibitor for petroleum; component of greases, waxes and paints.

lead styphnate. Legal label name for lead trinitroresorcinate (q.v.).

lead subcarbonate. See lead carbonate, basic.

lead subnitrite. See lead nitrite.

lead suboxide (lead oxide, black; litharge, leaded) Pb_2O.
Properties: Black, amorphous material; sp. gr. 8.342; decomposes on heating. Insoluble in water; soluble in acids and bases.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: In storage batteries.

lead, sugar of. See lead acetate.

lead sulfate $PbSO_4$.
Properties: White, rhombic crystals. Slightly soluble in hot water; insoluble in alcohol. Sp. gr. 6.12–6.39; m.p. 1170°C. Noncombustible.
Derivation: Interaction of solutions of lead nitrate and sodium sulfate.
Hazard: Toxic. Strong irritant to tissue. Tolerance, 0.15 mg per cubic meter of air.
Uses: Storage batteries; paint pigments.
Shipping regulations: (Air) Containing more than 3% free acid: Corrosive label.

lead sulfate, basic (white lead, sublimed; white lead sulfate). Approximate formula $PbSO_4 \cdot PbO$.
Properties: White monoclinic crystals; sp. gr. 6.92; m.p. 977°C; only slightly soluble in hot water or acids. Noncombustible.

Grades: Vary form 72 to 85% lead sulfate and remainder lead oxide. Sold dry or ground in oil.
Derivation: Three methods are used: (a) Lead sulfide ore (galena) is subjected to high temperatures in an oxidizing atmosphere. (b) Molten lead is sprayed into a jet of ignited fuel gas and air in the presence of sulfur dioxide gas. (c) Atomized metallic lead is mixed with water and sulfuric acid is added under controlled conditions.
Containers: Barrels; multiwall paper sacks.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Paints; ceramics; pigments.

lead sulfate, blue basic (sublimed blue lead; blue lead).
Composition: Lead sulfate (min) 45%, lead oxide (min) 30%, lead sulfide (max) 12%, lead sulfite (max) 5%, zinc oxide 5%, carbon and undetermined matter (max) 5%.
Properties: Blue-gray corrosion-inhibiting pigment; insoluble in water or alcohol. Sp. gr. 6.2. Noncombustible.
Derivation: By heating lead ores in special furnaces.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Component of structural-metal priming coat paints; rust-inhibitor in paints; lubricants; vinyl plastics, and rubber products.

lead sulfate, tribasic $3PbO \cdot PbSO_4 \cdot H_2O$.
Properties: Fine, white powder; sp. gr. 6.4; refractive index 2.1. Used for electrical and other vinyl compounds requiring high heat stability.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.

lead sulfide (plumbous sulfide) PbS.
Properties: Silvery, metallic crystals or black powder. Soluble in acids; insoluble in water and alkalies. Sp. gr. 7.13–7.7; m.p., 1114°C; sublimes at 1281°C.
Derivation: (a) Found in nature as the mineral galena (q.v.); (b) by passing hydrogen sulfide gas into an acid solution of lead nitrate.
Grades: Technical; C.P.; electronic.
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Ceramics; metallic lead; infrared radiation detector; semiconductor.

lead sulfite $PbSO_3$.
Properties: White powder; decomposes on heating. Insoluble in water; soluble in nitric acid.
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.

lead sulfocarbolate. See lead phenolsulfonate.

lead sulfocyanide. See lead thiocyanate.

lead superoxide. See lead dioxide.

lead tallate. A lead derivative of tall oil. Combustible.
Grades: Liquid, 16% Pb; 24% Pb; solid, 30% Pb.
Derivation: By the fusion process.
Hazard: Toxic. Absorbed by skin.
Uses: See soap (2).

lead telluride PbTe.
Properties: Crystalline solid; sp. gr. 8.2; m.p. 905°C. Insoluble in water and most acids.
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Single crystals used as photoconductor and semiconductor in thermocouples.

lead tetraacetate $Pb(CH_3COO)_4$.
Properties: Colorless or faintly pink crystals, sometimes moist with glacial acetic acid. M.p. 175°C; sp. gr. 2.228 (17°C); soluble in benzene, chloroform, nitrobenzene, hot glacial acetic acid. Combustible.
Derivation: From red lead (Pb_3O_4) and glacial acetic acid in the presence of acetic anhydride.
Containers: Glass bottles; fiber drums.
Hazard: Toxic. Absorbed by skin.
Uses: Selective oxidizing agent in organic synthesis; laboratory reagent.

lead tetraethyl. See tetraethyl lead.

lead thiocyanate (lead sulfocyanate) $Pb(SCN)_2$.
Properties: White or light-yellow, crystalline powder; soluble in potassium thiocyanate, nitric acid and slightly soluble in cold water; decomposes in hot water. Sp. gr. about 3.8.
Containers: Drums (100 lbs net).
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.
Uses: Ingredient of priming mixture for small-arms cartridges; safety matches; dyeing.

lead thiosulfate (lead hyposulfite) PbS_2O_3.
Properties: White crystals. Sp. gr. 5.18. Soluble in acids and sodium thiosulfate solution; insoluble in water. M.p., decomposes.
Derivation: By the interaction of solutions of lead nitrate and sodium thiosulfate, concentration and crystallization.
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.

lead titanate $PbTiO_3$.
Properties: Pale-yellow solid; insoluble in water. Sp. gr. 7.52.
Derivation: Interaction of oxides of lead and titanium at a high temperature. Contains lead sulfate and lead oxide as impurities.
Hazard: Toxic by ingestion and inhalation. Tolerance, 0.15 mg per cubic meter of air.
Use: Industrial paint pigment.

lead trinitroresorcinate (lead styphnate) $C_6H(NO_2)_3(O_2Pb)$.
Properties: Sp. gr. 3.1 for monohydrate and 2.9 for anhydrous. Monohydrate is monoclinic orange-yellow crystals; practically insoluble in water.
Derivation: Prepared by adding a solution of magnesium styphnate (from magnesium oxide and styphnic acid) to a lead salt solution.
Hazard: Detonates at 500°F; dangerous explosion risk. An initiating explosive.
Shipping regulations: (Air) Not accepted. (Rail) Consult regulations. Not accepted by express.

lead tungstate (lead wolframate) $PbWO_4$.
Properties: Yellowish powder. Soluble in acid; insoluble in water. Sp. gr. 8.235; m.p. 1130°C.
Derivation: By mixing solutions of lead nitrate and sodium tungstate, concentrating and crystallizing.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Use: Pigment.

lead vanadate (lead metavanadate) $Pb(VO_3)_2$.
Properties: Yellow powder; insoluble in water; decomposes in nitric acid.
Hazard: Toxic. Tolerance, 0.15 mg per cubic meter of air.
Uses: Preparation of other vanadium compounds; pigment.

"Lead V-1 (Dibasic)."[74] Precipitated dibasic lead stearate. Uniform white powder, 50% lead content. Used in plastics.

lead water. A 1% solution of basic lead acetate. Toxic. See lead acetate.

lead, white. See lead carbonate, basic; also lead silicate, basic; and lead sulfate, basic.

lead wolframate. See lead tungstate.

lead wool. Fine filaments or threads of metallic lead, prepared and used for packing pipe joints.

lead zirconate titanate (LZT) $PbTiZrO_3$. Forms piezoelectric crystals. Used as an element in hi-fi sets and as a transducer for ultrasonic cleaners; ferroelectric material in computer memory units.

"Leafseal."[563] Trademark for a formulation of decenylsuccinic acid and its esters. Used for direct application to plants to enable them to resist frost and drought.

leather. An animal skin or hide that has been permanently combined with a tanning agent, which causes a physicochemical change in the protein components of the skin. This change renders it resistant to putrefactive bacteria, enzymes, and hot water, increases its strength and abrasion resistance, and makes it serviceable for long periods of time. Tanning agents are either vegetable, mineral, or synthetic. (See tanning). Hides from cows or steers are chiefly used for men's shoes, transmission belting, and other heavy-duty service. These are usually vegetable-tanned. Lighter grades made from the skins of sheep, calves, or reptiles are used for shoe uppers, luggage, gloves, and similar end products (chrome-tanned).

Leather is a naturally poromeric material which retains the microporosity of the original skin; this property makes it uniquely applicable to footwear; to a limited extent it is able to conform to the contour of the individual foot. Leather is made in many colors, weights and finishes. However, it is being replaced to an increasing extent by plastics for many minor uses and by synthetics for shoe uppers and soling. For further information refer to American Leather Chemists' Assn., University of Cincinnati, Cincinnati, Ohio. See also poromeric.

leavening agent. See yeast; baking powder.

Le Blanc (1742–1806). French inventor of the first successful process for making soda ash. His patent was confiscated by the Revolutionist government and the process was used widely for years without either acknowledgment or remuneratoin. His original formula was 100 parts salt cake, 100 parts limestone and 50 parts coal.

Le Chatelier (1850–1936). French physical chemist, famous chiefly for his statement of the equilibrium principle (often known as Le Chatelier's Law). His work included investigations of cements, alloys, and gaseous combustion. The principle may be stated: every system in equilibrium is conservative, and tends to resist the changes upon it by reacting in such a way as to help nullify the imposed change.

Lechanché cell. See dry cell.

lecithin. Pure lecithin is a phosphatidyl choline. $CH_2(R)CH(R')CH_2OPO(OH)O(CH_2)_2N(OH)(CH_3)_3$, R and R' being fatty acid groups. The lecithins are mixtures of diglycerides of fatty acids linked to the choline ester of phosphoric acid. The lecithins are classed as phosphoglycerides or phosphatides (phospholipids). Commercial lecithin is a mixture of acetone-insoluble phosphatides. F.C.C. specifies not less than 50% acetone-insoluble matter (phosphatides).

Properties: Light brown to brown, viscous semiliquid with a characteristic odor; partly soluble in water and acetone; soluble in chloroform and benzene. Nontoxic.

Derivation: Usually from soybean oil; also from corn, other vegetable seeds, egg yolk and other animal sources.

Grades: Technical, unbleached, bleached; fluid; plastic; edible; F.C.C.; 96+% (for biochemical or chromatographic standards).

Uses: Emulsifying, dispersing, wetting, penetrating agent and antioxidant; in margarine, mayonnaise, chocolate and candies, baked goods, animal feeds; paints; petroleum industry (drilling, leaded gasoline); printing inks; soaps and cosmetics; mold release for plastics; blending agent in oils and resins; rubber processing; lubricant for textile fibers.

"Lecton."[28] Trademark for acrylic resin-coated glass fabrics and laminates used as electric insulating material because of thermal stability up to 130°C. Resistant to fluorinated hydrocarbons.

"Lectro."[104] Trademark for a series of lead vinyl stabilizers.

60. A lead chlorosilicate complex. A fine white powder; sp. gr. 3.9; refractive index, 2.1. Used for vinyl electrical insulation and tapes.

78. Tetrabasic lead fumarate. Creamy white powder; sp. gr. 6.5; refractive index, 2.1. Used for heat stabilizer for electrical grade plastisols, phonograph records and electrical insulation.

Containers: Up to 325-lb fiberboard drums.

"Ledate."[89] Trademark for lead dimethyldithiocarbamate (q.v.).

Leeuwenhoek, A. van (1632–1723). A self-educated hobbyist and experimenter of Delft, Holland. He was a member of several scientific societies. His chief contribution was invention of the simple microscope about 1700.

legal chemistry (forensic chemistry). The application of chemical knowledge and procedures to matters involving civil or criminal law, and to all questions where control of chemical compounds, products, or processes is vested in agencies of Federal or state governments. Leal chemistry applies to the following areas:

(1) Crime detection: primarily identification of poisons (see toxicology), of bloodstains, writing and typewriter inks, and a host of miscellaneous materials such as textile fibers from clothing, hair, skin, etc. A variety of analytical methods are used in police laboratories, including microscopes, spot tests, color reactions, and spectrophotometry.

(2) Food, drugs, and cosmetics are under the control of the U.S. Food and Drug Administration. New products and proposed additives must be submitted by the manufacturer and approved before being placed on public sale. Control of the manufacture of illicit drugs is an important phase of legal chemistry.

(3) Pesticides are subject to Federal regulation. New products must be registered; labeling must be specific as to chemical composition, active and inert ingredients, and directions for use.

(4) Marketing and competitive pricing of chemical products' fair trade agreements and discriminatory