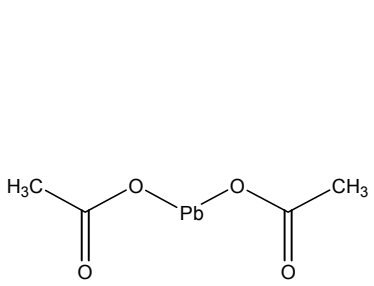
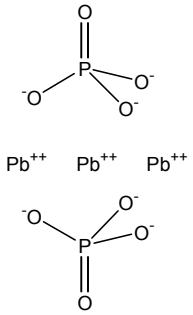
LEAD ACETATE AND LEAD PHOSPHATE
CAS Nos. 301-04-2 and 7446-27-7
First Listed in the *Second Annual Report on Carcinogens*



Lead acetate



Lead phosphate

CARCINOGENICITY

Lead acetate and lead phosphate are *reasonably anticipated to be human carcinogens* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1972, 1980, 1982, 1987). When administered in the diet, lead acetate induced renal adenomas and carcinomas and cerebral gliomas in rats of both sexes. Subcutaneous injections of lead phosphate induced renal cortical tumors, including adenomas, papillomas, cystadenomas, and carcinomas in rats.

There is inadequate evidence for the carcinogenicity of lead acetate and lead phosphate in humans (IARC 1987).

PROPERTIES

Lead acetate and its trihydrate (CAS No. 6080-56-4) occur in the form of white or colorless crystals or flakes; the commercial grades are frequently brown or gray lumps. Lead acetate has a sweetish taste and a slight acetic odor. In the United States, lead acetate is generally marketed as lead acetate trihydrate, and is available in reagent, purified, and technical grades. Typically, trace impurities are iron and chlorides (Cl^-). Lead acetate and its trihydrate are soluble in water, slightly soluble in alcohol, and very soluble in glycerol. Lead phosphate occurs either in the form of hexagonal crystals or as a white powder that is insoluble in water and alcohol. It is soluble in acids and alkali. When heated to decomposition, lead acetate, lead acetate trihydrate, and lead phosphate emit toxic fumes of lead oxide (HSDB 2000).

USE

Lead acetate is often used for the preparation of other lead salts by the wet method (Kirk-Othmer 1981). The commercial form of lead acetate, lead acetate trihydrate, is used as a mordant in cotton dyes, as a lead coating for metals, as a drier in paints, varnishes, and pigment inks, and as a colorant in hair dyes (IARC 1980, Sax 1987, Sittig 1985). It is also used in antifouling paints, waterproofing, insecticides, and the gold cyanidation process (Sax 1987). Lead acetate has been used in explosives and in dilute solutions as poultices and washes for treatment of

poison ivy. Formerly, it was used as a pharmaceutical in astringents (IARC 1980). Lead phosphate is used as a stabilizer in styrene and casein plastics and in small amounts in special glasses (IARC 1980, Sax 1987).

PRODUCTION

Current domestic production volumes for lead acetate and lead phosphate are not available. There is no evidence that lead phosphate is produced in commercial quantities in the United States. In 1986, there were seven producers and five suppliers of lead acetate, and one supplier of lead phosphate (Chem Sources 1986). More recently, Chem Sources (2001) lists 32 suppliers of lead acetate and five suppliers of lead phosphate. U.S. imports of lead acetate were 115,411 lb in 1985 and 111,201 lb in 1984 (USDOC Imports 1985, 1986). In 1978, 250 lb of lead acetate were imported (IARC 1980). The 1979 TSCA Inventory identified six companies producing 661,000 lb of lead acetate in 1977 and 1 importer with no volume reported, with some site limitations. The TSCA Inventory identified one importer of lead phosphate in 1977, but no volume was reported (TSCA 1979). Lead acetate was first produced commercially in the U.S. in 1944 (IARC 1980).

EXPOSURE

The primary routes of potential human exposure to lead acetate and lead phosphate are ingestion, inhalation, and dermal contact. Lead acetate is absorbed approximately 1.5 times faster as other lead compounds. In 1978, sales of hair dyes containing lead acetate exceeded 1 million bottles (Sittig 1985). The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that 132,000 and 18,000 workers were possibly exposed to lead acetate and lead phosphate, respectively, in the workplace (NIOSH 1976). However, OSHA has estimated that 223,000 workers may be exposed to lead acetate, 28,000 to lead phosphate dibasic, and 27,000 to lead phosphate tribasic. The variability is the result of different methods used to estimate exposure (Sittig 1985). It has been estimated that airborne emissions of lead in the United States are 46.9 million lb per year (Chem. Engr. News 1988). Additional exposure information may be found in the ATSDR Toxicological Profile for Lead (ATSDR 1999).

REGULATIONS

CPSC initially banned the use of certain lead-containing paints and similar surface-coating materials in consumer products under the Federal Hazardous Substances Act (FHSA). The ban on lead or lead compounds applied when the lead content exceeded 0.5% of the weight of the product, but excluded artists' paints and related materials. The Consumer Product Safety Act (CPSA) amended the limit of lead content in paints from 0.5% to 0.06% of the weight of the product. CPSC evaluated consumer exposure to lead inks in printed consumer products and found no lead in printed matter intended for children; lead was found in some inks used in printed products, but the levels in the final products did not warrant further action. CPSC found little lead in other printed consumer products. In 1996, CPSC found that lead compounds used as stabilizers in imported vinyl miniblinds could present a hazard to small children. Manufacturers voluntarily removed lead from miniblinds. Also in 1996, CPSC found that many school, park and community playgrounds across the U.S. had painted metal or wood playground equipment that presented a potential lead paint poisoning hazard for young children, and distributed guidance to state health officials and others about identifying and controlling this hazard. In 1997, CPSC found low or non-detectable levels of lead in children’s products made

from polyvinyl chloride, and concluded that these levels were not hazardous. In 1998, CPSC issued guidance for lead in consumer products, requesting that manufacturers eliminated the use of lead that may be accessible to children from products used in or around the home, schools, or in recreation. CPSC recommends that children not be exposed to more that 15 μg of lead per day from consumer products. In 1999, CPSC investigated the emissions of lead from candles with lead core wick and found that some candles release sufficient lead to result in elevated levels in children. In 2001, CPSC initiated a rulemaking activity that could result in a ban in the use of lead in candlewicks.

EPA regulates lead and certain lead compounds under the Clean Water Act (CWA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Superfund Amendments and Reauthorization Act (SARA), and Safe Drinking Water Act (SDWA). The dissociated lead ion addressed in these regulations would provide a degree of control over many lead compounds, including lead acetate and lead phosphate. EPA has established a maximum concentration for lead of 0.05 μg/L in wastes for the protection of health under RCRA, and has published a water quality criteria document under CWA for the protection of human health. Under the SDWA, EPA has set a treatment technique for lead, with an action level of 0.015 mg/L. Reportable quantities (RQs) of 5,000 lb (subject to carcinogenicity assessment) have been established for lead acetate and 1 lb (statutory) for lead phosphate under CERCLA.

FDA regulates the use of lead acetate in hair dyes under the Food, Drug, and Cosmetic Act (FD&CA).

ACGIH recommends a threshold limit value (TLV) for both lead acetate and lead phosphate of 0.050 mg/m^3. NIOSH has set a recommended exposure limit (REL) of 0.050 mg/m^3 for lead compounds. OSHA established a permissible exposure limit (PEL) of 50 μg/m^3 as an 8-hr time-weighted average (TWA) and 50 μg/100 g as the maximum permissible lead level in blood; the standard requires personal protective equipment, engineering and work practice controls, and medical surveillance with provisions for medical removal. OSHA regulates lead on the basis of acute and chronic toxicity for several organ systems, but not on the basis of carcinogenicity. OSHA regulates lead acetate and lead phosphate under the Hazard Communication Standard and as chemical hazards in laboratories. Regulations are summarized in Volume II, Table 101.

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