

Titanium tetrachloride

7550-45-0

Hazard Summary

Environmental exposure to titanium tetrachloride is unlikely because it breaks down rapidly in water. Titanium tetrachloride is highly irritating to the skin, eyes, and mucous membranes in humans. Acute (short-term) exposure may result in surface skin burns and marked congestion and constriction of various sections of the upper respiratory tract in humans. Acute exposure may also damage the eyes. Diseases of the lung (pleural diseases) have been associated with chronic (long-term) occupational exposure of titanium tetrachloride in titanium metal production workers. Chronic inhalation exposure may result in upper respiratory tract irritation, chronic bronchitis, cough, bronchoconstriction, wheezing, chemical pneumonitis, or pulmonary edema in humans. EPA has not classified titanium tetrachloride with respect to carcinogenicity.

Please Note: The main source of information for this fact sheet is the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Titanium Tetrachloride. (3)

Uses

- Titanium tetrachloride is used as an intermediate in the production of titanium metal, titanium dioxide, and titanium pigments, in the manufacture of iridescent glass and artificial pearls, as a polymerization catalyst, and to produce smoke screens. (1,3)
- Titanium tetrachloride was formerly used with potassium bitartrate as mordant in the textile industry and with dyewoods in dyeing leather. (1,3,4)

Sources and Potential Exposure

- Occupational exposure to titanium tetrachloride may occur via inhalation or dermal contact during its manufacture and use. (3)
- Because titanium tetrachloride rapidly hydrolyzes upon contact with water, it is unlikely to be transported significant distances in any environmental media. No information is available on the concentration of titanium tetrachloride in air, water, soil, or food. Exposure of the general population is unlikely. (3)

Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to titanium tetrachloride.

Health Hazard Information

Acute Effects:

- Titanium tetrachloride is highly irritating to the skin, eyes, mucous membranes, and respiratory tract in humans. Acute exposure may result in surface skin burns, marked congestion of mucous membranes of the pharynx, vocal cords, and trachea, and stenosis (constriction) of the larynx, trachea, and upper bronchi in humans. Acute exposure may also damage the cornea. (1,3)
- A worker accidentally exposed to a high concentration of titanium tetrachloride via inhalation later developed endobronchial polyps. (1)

- Eye injury, including corneal opacity, necrotic keratitis, and conjunctivitis, occurred in rats acutely exposed to titanium tetrachloride vapors. (1,3)
- Acute animal tests in rats and mice have demonstrated titanium tetrachloride to have high to extreme acute toxicity via inhalation. (2)

Chronic Effects (Noncancer):

- Pleural thickening and decreased pulmonary function have been associated with chronic occupational exposure of titanium tetrachloride in titanium metal production workers. (1,3)
- Chronic inhalation exposure may result in upper respiratory tract irritation, chronic bronchitis, cough, bronchoconstriction, wheezing, chemical pneumonitis, or pulmonary edema in humans. (1)
- Respiratory effects have also been observed in animals chronically exposed to titanium tetrachloride via inhalation. (3)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for titanium tetrachloride.
- ATSDR has calculated a chronic inhalation minimal risk level (MRL) of 0.0001 milligrams per cubic meter (mg/m^3) based on respiratory effects in rats. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. Exposure to a level above the MRL does not mean that adverse health effects will occur. The MRL is intended to serve as a screening tool. (3)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of titanium tetrachloride in humans or animals.

Cancer Risk:

- No association between titanium tetrachloride exposure and lung cancer mortality was found in one study of occupationally exposed workers. (3)
- No carcinogenic were observed in rats chronically exposed to titanium tetrachloride via inhalation. (3)
- EPA has not classified titanium tetrachloride with respect to carcinogenicity.

Physical Properties

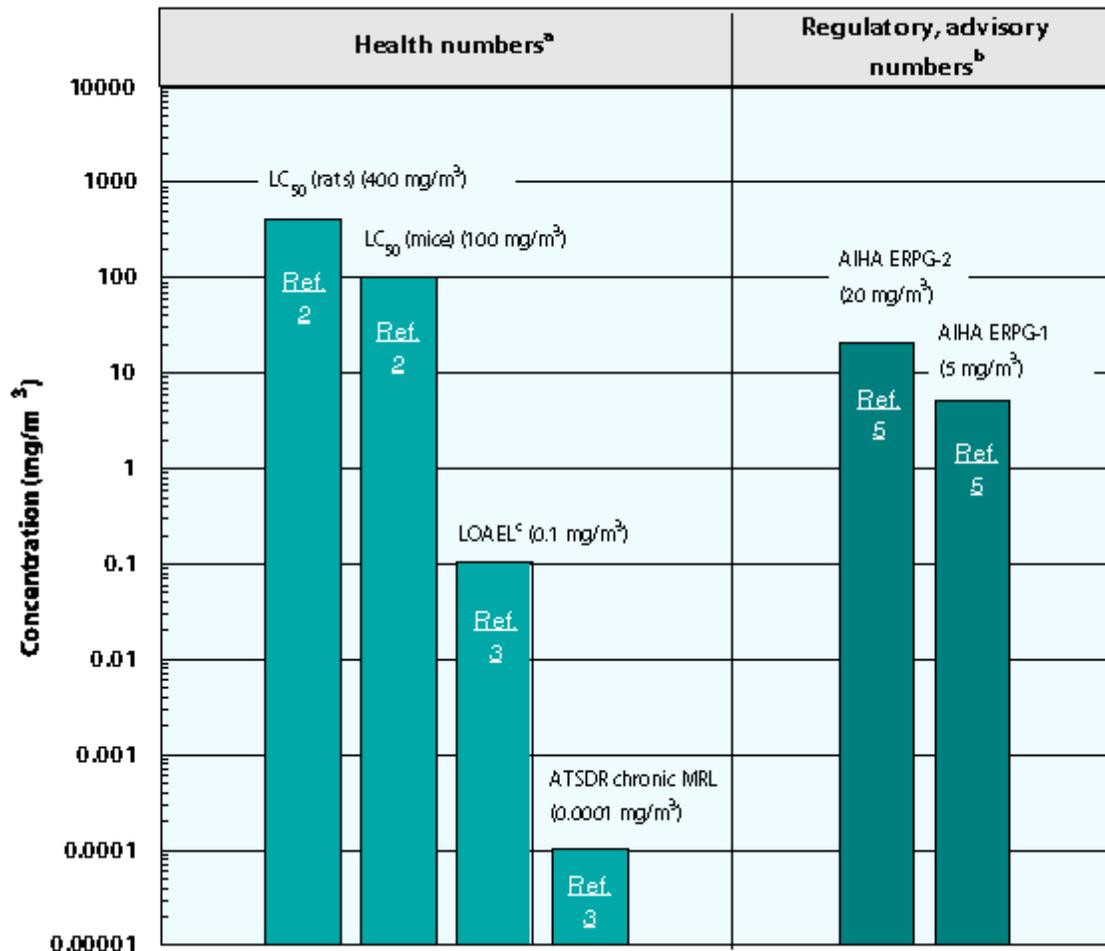
- The chemical formula for titanium tetrachloride is TiCl_4 , and its molecular weight is 189.73 g/mol. (4)
- Titanium tetrachloride occurs as a colorless to light yellow liquid that is soluble in cold water and decomposes in hot water. (1,4)
- Titanium tetrachloride has a penetrating acid odor; the odor threshold has not been established. (1,3,4)
- The vapor pressure of titanium tetrachloride is 10.0 mm Hg at 20 °C. (3)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $\text{mg}/\text{m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For titanium tetrachloride: 1 ppm = 7.76 mg/m^3 .

Health Data from Inhalation Exposure

Titanium Tetrachloride



AIHA ERPG--American Industrial Hygiene Association's emergency response planning guidelines. ERPG 1 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor; ERPG 2 is the maximum airborne concentration below which it is believed nearly all individuals could be exposed up to one hour without experiencing or developing irreversible or other serious health effects that could impair their abilities to take protective action.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL--Lowest observed adverse effect level.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. AIHA numbers are advisory.

^c The LOAEL is from the critical study used as the basis for the ATSDR chronic inhalation MRL.

Summary created in April 1992, updated in January 2000

References

1. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, [online database](#)). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
2. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, [online database](#)). National Toxicology Information Program, National Library of Medicine, Bethesda, MD.

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3. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Titanium Tetrachloride. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1997.
4. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
5. American Industrial Hygiene Association (AIHA). The AIHA 1998 Emergency Response Planning Guidelines and Workplace Environmental Exposure Level Guides Handbook. 1998.