

CHLORINE DIOXIDE

CAS Registry Number: 10049-04-4

OCIO

Molecular Formula: ClO₂

Chlorine dioxide is a strongly oxidizing, yellow to reddish-yellow gas at room temperature. It has an unpleasant odor similar to that of chlorine and nitric acid. It is unstable in light; stable in dark if pure, but chlorides will catalyze its decomposition even in the dark. It is soluble in water, alkaline and sulfuric acid solutions. Chlorine dioxide reacts violently with organic chemicals and can be detonated by sunlight, heat, or contact with mercury or carbon monoxide (Merck, 1989).

Physical Properties of Chlorine Dioxide

Synonyms: chlorine oxide; alcide; anthium dioxide; chlorine peroxide; chloryl radical; chloroperoxy; doxide 50

Molecular Weight:	67.46
Boiling Point:	11 °C
Melting Point:	-59 °C
Density/Specific Gravity:	3.09 g/l at 11 °C
Density (liquid):	1.642

(HSDB, 1991; Merck, 1989; Sax, 1989)

SOURCES AND EMISSIONS

A. Sources

Chlorine dioxide is used in cleaning and detanning of leather, and as a bleaching agent for wood pulp, fats and oils, cellulose, flour, textiles, and beeswax (HSDB, 1991).

Chlorine dioxide is registered as a bactericide, fungicide and algacide. It is used to disinfect human drinking water systems, commercial water cooling tower systems, and metal cutting fluids. It may also be used to disinfect dairy farm animals and milking equipment, in eating establishments and food processing/handling areas and around the house (DPR, 1996). The primary stationary sources that have reported emissions of chlorine dioxide in California are preserved fruit and vegetable products (ARB, 1997b).

The licensing and regulation of pesticides for sale and use in California are the responsibility of

the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of chlorine dioxide has been collected from pesticide labels registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

B. Emissions

The total emissions of chlorine dioxide from stationary sources in California are estimated to be at least 1,100 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of chlorine dioxide was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of chlorine dioxide.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of chlorine dioxide was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Chlorine dioxide exists in the atmosphere in the gas phase. It will photolyze rapidly, with a tropospheric half-life and lifetime of a few seconds (DeMore et al., 1994).

AB 2588 RISK ASSESSMENT INFORMATION

Chloride dioxide emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to chlorine dioxide are inhalation, ingestion, and dermal contact.

Non-Cancer: Chlorine dioxide vapor is irritating to the eyes and respiratory tract. There have been reports of sensory irritation and bronchitis in workers exposed to concentrations up to 0.28 milligrams per cubic meter (mg/m^3) chlorine dioxide (Gloemme and Lundgren, 1957).

The United States Environmental Protection Agency (U.S. EPA) has recommended a Reference Concentration (RfC) of 0.2 micrograms per cubic meter based on pulmonary edema and hemorrhagic alveoli in rats exposed for 2 months to $2.8 \text{ mg}/\text{m}^3$ of chlorine dioxide. The U.S. EPA estimates that inhalation of this concentration or less, over a lifetime, would not likely result in the occurrence of chronic non-cancer effects. The U.S. EPA has not established an oral Reference Dose (RfD) (U.S. EPA, 1995a).

Cancer: The International Agency for Research on Cancer and the U.S. EPA have not classified chlorine dioxide with respect to potential carcinogenicity (IARC, 1987a; U.S. EPA, 1994a).

