CARBON DISULFIDE

Carbon disulfide is a federal hazardous air pollutant and was identified as a
toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 75-15-0 CS_2

Molecular Formula: CS_2

Carbon disulfide is a highly refractive, mobile, and very flammable liquid. The purest distillates have a sweet odor. However, the usual commercial and reagent grades of carbon disulfide are foul smelling. It burns with a blue flame to form carbon dioxide and sulfur dioxide. Liquid carbon disulfide will attack some forms of plastics, rubber, and coatings but is non-corrosive to most commercial structural materials at ordinary temperatures. It is miscible in water, alcohol, oils, chloroform, and ether (Merck, 1989).

Physical Properties of Carbon Disulfide

Synonyms: carbon bisulfide; carbon disulphide; carbon sulfide; sulphocarbonic anhydride; sulphuret of carbon; dithiocarbonic anhydride

Molecular Weight:	76.14
Boiling Point:	46.5 °C
Melting Point:	-111.5 °C
Vapor Density:	2.67 (air =1)
Flash Point:	-30 °C (closed cup)
Density/Specific Gravity:	1.2632 at 20/4 °C (water = 1)
Critical Temperature:	280 °C
Vapor Pressure:	297 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	1.70 - 4.16
Conversion Factor:	1 ppm = 3.11 mg/m^3

(Howard, 1990; HSDB, 1991; Merck, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Carbon disulfide is used in the preparation of rayon viscose fibers, and as a solvent for lipids, phosphorus, sulfur, selenium, bromine, iodine, rubber, resins, and waxes (Proctor et al, 1991). Carbon disulfide is also used in the manufacture of carbon tetrachloride, cellophane, flotation agents, xanthogenates, and numerous other chemicals (HSDB, 1991; Sax, 1987). The primary stationary sources that have reported emissions of carbon disulfide in California are sanitary services, gas production and distribution, and water transportation services (ARB, 1997b).

Carbon disulfide was registered for use as a pesticide, however as of January 1, 1987, it is no longer registered for pesticidal use in California (DPR, 1996).

B. Emissions

The total emissions of carbon disulfide from stationary sources in California are estimated to be at least 110 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Minute amounts of carbon disulfide occur in coal tar and in crude petroleum. Carbon disulfide is a natural product of anaerobic biodegradation and is released to the atmosphere from oceans and land masses as well as geothermal sources. The ocean appears to be a major source of carbon disulfide. Coastal and marshland areas of high biological activity are also a major source (HSDB, 1991).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of carbon disulfide. However, the United States Environmental Protection Agency (U.S. EPA) has compiled information from three U.S. urban and suburban locations from 1979-82 that reported a mean concentration of 0.3 micrograms per cubic meter or 0.1 parts per billion (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information on indoor sources and concentrations of carbon disulfide was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Carbon disulfide reacts with the hydroxyl (OH) radical in the atmosphere, with the effective rate constant depending on O_2 concentration and total pressure. Based on the literature rate constant at one atmosphere of air (Atkinson et al., 1992), the calculated half-life and lifetime of carbon disulfide due to its reaction with the OH radical are about 8 days and 12 days, respectively. Its reaction products include carbonyl sulfide and sulfur dioxide (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Although carbon disulfide is reported as being emitted in California from stationary sources no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to carbon disulfide are inhalation, ingestion, and dermal contact (HSDB, 1991; Sittig, 1991).

Non-Cancer: Inhalation exposure to carbon disulfide vapors may cause irritation to the eyes and respiratory tract. Carbon disulfide is a central nervous system depressant and may cause liver and kidney injury. It causes peripheral and cranial neuropathies and may cause arteriosclerosis. Long-term inhalation exposure may cause coronary heart disease, and behavioral and neurophysiological changes (HSDB, 1991; U.S. EPA, 1994a).

The U.S. EPA has established an oral Reference Dose (RfD) of 0.1 milligrams per kilogram per day for carbon disulfide based on fetal toxicity and malformations in rabbits. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not result in the occurrence of chronic, non-cancer effects. The U.S. EPA has the Reference Concentration (RfC) under review (U.S. EPA, 1994a).

Adverse human reproductive effects caused by inhalation exposure include decreased sperm count and menstrual disturbances (U.S. EPA, 1994a). The State of California has determined under Proposition 65 that carbon disulfide is a male, female, and developmental reproductive toxicant (CCR, 1996).

Cancer: According to the U.S. EPA fact sheet on carbon disulfide, a study of workers exposed by inhalation to carbon disulfide and other solvents showed that there was an increased incidence of lymphatic leukemia. However, there were many confounding factors in this study which made it difficult to interpret the results (U.S. EPA, 1994a).

The U.S. EPA has placed carbon disulfide in Group D: Not classifiable as to human carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified carbon disulfide as to its carcinogenicity (IARC, 1987a).