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Material Safety Data Sheets Collection:

Sheet No. 410
Carbon Tetrachloride

Issued: 12/80

Revision: B, 4/90

Section 1. Material Identification

Carbon Tetrachloride Description: A chlorinated hydrocarbon derived from interacting carbon disulfide and chlorine in the presence of iron, or chlorination of methane or higher hydrocarbons at 482 °F/250 °C to 752 °F/400 °C. Carbon tetrachloride is treated with caustic alkali solution to remove sulfur chloride. Its primary use is in manufacturing fluoro-carbon propellants. It is also used in producing of semiconductors, chlorinating organic compounds, metal degreasing, refrigerants; as a solvent for oils, fats, resins, rubber waxes, lacquers, and varnishes; and as an agricultural fumigant. This material was widely used in the dry-cleaning industry.

Other Designations: CAS No. 0056-23-5; CCl₄; carbon chloride; carbon tet; methane tetrachloride; perchloromethane; tetrachlorocarbon; tetrachloromethane.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*TM for a suppliers list.

R 1
I 4
S 2*
K 0
*Skin
absorption

31
NFPA
0
3
0
HMIS
H 3
F 0
R 0
PPG†
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Carbon tetrachloride, ca 100%

OSHA PEL

8-hr TWA: 2 ppm, 12.6 mg/m³

ACGIH TLV (Skin), 1989-90

TLV-TWA: 5 ppm, 31 mg/m³

NIOSH REL, 1987

60-min ceiling: 2 ppm, 12.6 mg/m³

Toxicity Data*

Rat. oral LD₅₀: 2800 mg/kg; toxic effects not yet reviewed

Rat. inhalation, LC₅₀: 8000 ppm over 4 hr; no toxic effect noted

Human. inhalation, TC₅₀: 20 ppm inhaled produces gastrointestinal effects (nausea or vomiting)

* See NIOSH, RTECS (FG4900000), for additional irritative, mutative, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 169.77 °F/76.54 °C

Melting Point: -9.4 °F/-23 °C

Vapor Pressure: 91.3 mm Hg at 68 °F/20 °C

Vapor Density (Air = 1): 5.32

Molecular Weight: 153.84 g/mol

Specific Gravity (H₂O = 1 at 39 °F/4 °C): 1.5940 at 68 °F/20 °C

Water Solubility: Very slightly soluble (800 mg/l at 68 °F/20 °C)

Evaporation Rate (Butyl Acetate = 1): 12.8

Appearance and Odor: A colorless liquid with a heavy ethereal odor. The high and low odor thresholds are, respectively, 128.4 and 60 mg/m³. Odor is not an adequate warning sign to prevent overexposure.

Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: None reported

LEL: None reported

UEL: None reported

Extinguishing Media: Carbon tetrachloride is nonflammable and will not support combustion. Use extinguishing media appropriate to the surrounding fire. This material was previously used as an extinguishing medium in portable fire extinguishers, but its toxicity and fire decomposition products lead to its replacement with "safer" extinguishing media.

Unusual Fire or Explosion Hazards: Carbon tetrachloride can react violently with hot or burning metals such as aluminum and magnesium.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and fully encapsulating suit. Use water spray to cool fire-exposed containers. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Carbon tetrachloride is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Carbon tetrachloride reacts violently with fluorine gas, alkali metals, and aluminum (see reference 126 for specific incompatibilities).

Conditions to Avoid: This material has caused explosions when used as a fire extinguisher on wax fires and uranium fires. It may also form toxic phosgene when used to put out electrical fires.

Hazardous Products of Decomposition: Thermal oxidative decomposition of carbon tetrachloride can produce toxic phosgene and hydrogen chloride.

Section 6. Health Hazard Data

Carcinogenicity: The NTP, IARC, and ACGIH list carbon tetrachloride as an anticipated human carcinogen, a possible human carcinogen, and a suspected human carcinogen, respectively.

Summary of Risks: Carbon tetrachloride is highly toxic and irritating by inhalation, ingestion (mean lethal dose is 5 to 10 ml), and skin absorption. Alcohol's synergistic effects markedly increase CCl_4 's toxicity. Excessive exposure may result in central nervous system depression, cardiac arrhythmias, and gastrointestinal symptoms. In humans the majority of fatalities have been the result of renal injury with secondary cardiac failure. Kidney and liver damage can occur from severe acute or chronic exposure. Human liver damage occurs more often after ingestion of the liquid than after the inhalation of the vapor. However, after a 30 min to 1 hr exposure to concentrations of 1000 to 2000 ppm, humans have died from acute renal damage.

Medical Conditions Aggravated by Long-Term Exposure: Prolonged recovery and permanent disability of the liver, kidney, and lungs are possible.

Target Organs: Central nervous system, eyes, skin, liver, kidneys, lungs.

Primary Entry Routes: Inhalation, percutaneous (through the skin).

Acute Effects: Acute exposure symptoms include eye, nose, skin, and throat irritation; cough, dyspnea, cyanosis, cardiac arrhythmias, headaches, dizziness, mental confusion, nausea, vomiting, abdominal pain, and diarrhea. Jaundice and abnormal liver enlargement accompanied by oliguria (reduced excretion of urine), proteinuria (protein in urine), and hematuria (blood in urine) may occur even after several days delay.

Chronic Effects: Chronic exposure symptoms include defatting dermatitis, headaches, dizziness, mental confusion, apathy, anorexia, nausea, vomiting, abdominal pain, weight loss, narrowing of visual field, optic nerve damage with possible blindness, hearing loss, and renal and hepatic decompensation (loss of these organs' ability to correct dysfunction). Chronic exposure may result in the development of aplastic anemia.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

Skin: Quickly remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Give one to two glasses of water to dilute and induce vomiting, unless the person shows evidence of decreasing mental functioning and awareness.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: To minimize hepatorenal damage, consider intravenous acetylcysteine. Hyperbaric oxygen is also utilized for significant exposures. Dialysis has also been suggested in severe cases. Give cardiorespiratory support as indicated and carefully monitor fluid and electrolytes. Closely monitor hepatic and renal functions. Avoid epinephrine because of myocardial sensitization and potential for inducing ventricular arrhythmias.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area, and provide maximum exhaust ventilation. Cleanup personnel should protect against inhalation and skin and eye contact. Small spills can be absorbed on paper or some noncombustible, inert ingredient and allowed to evaporate in a hood. For large spills, dike far ahead to contain spill for disposal. Prevent release of CCl_4 to surface water or sewers. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33)

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per RCRA, Sec. 3001, per Clean Water Act, Sec. 307(a), 311 (b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-2)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.

Warning: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Polyvinyl alcohol protective gear is recommended.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL, ACGIH TLV, and NIOSH REL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰⁹⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed container in a cool, dry, well-ventilated, low fire-risk area away from incompatible materials (Sec. 5), direct sunlight, and heat. Prevent exposure of vapors to high temperature to prevent decomposition to toxic and corrosive gases and vapors.

Engineering Controls: Avoid vapor inhalation and skin or eye contact. Use only with adequate ventilation and appropriate personal protective gear. Monitor vapor levels and institute a respiratory protection program which includes training, maintenance, inspection, and evaluation.

Practice good personal hygiene procedures. When possible, substitute a less hazardous solvent for CCl_4 . Provide preplacement and biannual medical exams, including studies of liver and kidney function. Prevent exposing individuals with liver, kidney, or central nervous system diseases, or alcoholism. Alcohol's synergistic effects markedly increase CCl_4 's toxicity.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Carbon tetrachloride

DOT Hazard Class: ORM-A

ID No.: UN1846

DOT Label: None

DOT Packaging Requirements: 173.620

DOT Packaging Exceptions: 173.505

IMO Shipping Name: Carbon tetrachloride

IMO Hazard Class: 6.1

IMO Label: Poison

IMDG Packaging Group: II

ID No.: UN1846

MSDS Collection References: 7, 26, 38, 53, 73, 84, 85, 88, 89, 100, 103, 109, 124, 126, 127, 129, 130, 131, 134, 136, 137

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DO A 021948
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