

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
	CARCINOGEN. MINIMIZE EXPOSURE. Combustible material; avoid heat and sources of ignition. This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment. This compound is a possible skin sensitizer. Irritating to skin, eyes, and the respiratory system.	

Section I. Chemical Product and Company Identification

Chemical Name	(+)-Limonene		
Catalog Number	L0105	Supplier	TCl America 9211 N. Harborgate St. Portland OR 1-800-423-8616
Synonym	(+)-p-Mentha-1,8-diene		
Chemical Formula	C ₁₀ H ₁₆		
CAS Number	5989-27-5	In case of Emergency Call	Chemtrec® (800) 424-9300 (U.S.) (703) 527-3887 (International)

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
(+)-Limonene	5989-27-5	Min. 99.0(GC)	This chemical is classified as a carcinogen. There is no acceptable exposure limit for a carcinogen.	Rat LD ₅₀ (oral) 4400mg/kg Rat LD ₅₀ (intravenous) 110mg/kg Rabbit LD ₅₀ (dermal) >5gm/kg

Section III. Hazards Identification

Acute Health Effects	Skin contact may result in sensitization. Always cover all exposed skin with an impermeable layer and use proper eye protection. A OSHA/MSHA approved dust and vapor respirator is required when working with this material. Irritating to eyes and skin on contact. Inhalation causes irritation of the lungs and respiratory system. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.
Chronic Health Effects	CARCINOGENIC EFFECTS : Carcinogenic by RTECS criteria. MUTAGENIC EFFECTS : Not available. TERATOGENIC EFFECTS : TUMORIGENIC EFFECTS: Rat TDLo (oral) 38625mg/kg/103 Weeks, intermittent. Toxic Effects: Tumorigenic- Carcinogenic by RTECS criteria. Kidney, Ureter and Bladder- Kidney tumors. Rat TDLo (oral) 38625mg/kg/2 Years, continuous. Toxic Effects: Tumorigenic- Carcinogenic by RTECS criteria. Kidney, Ureter, and Bladder- Kidney tumors. Tumorigenic Effects- Testicular tumors. Mouse TDLo (oral) 67gm/kg/39 Weeks, intermittent. Toxic Effects: Tumorigenic- Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal- Tumors. DEVELOPMENTAL TOXICITY REPRODUCTIVE EFFECTS: Rat TDLo (oral) 20083mg/kg, female, 9-15 Days of pregnancy. Toxic Effects: Specific Developmental Abnormalities- Musculoskeletal system. Effects on Newborn- Growth statistics. Effects on Newborn- Physical. Mouse TDLo (oral) 3546mg/kg, female, 7-12 Days of pregnancy. Specific Developmental Abnormalities- Musculoskeletal system. Effects on Newborn- Physical. Rabbit TDLo (oral) 3250mg/kg, female, 6-18 Days of pregnancy. Toxic Effects: Effects on Newborn- Physical. Repeated or prolonged exposure to this compound is not known to aggravate existing medical conditions.

Section IV. First Aid Measures

Eye Contact	Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Skin Contact	In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.
Inhalation	If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not improve.
Ingestion	INDUCE VOMITING by sticking finger in throat. Lower the head so that the vomit will not reenter the mouth and throat. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive.

Section V. Fire and Explosion Data

Flammability	Combustible.	Auto-Ignition	Not available.
Flash Points	48°C (118.4°F).	Flammable Limits	LOWER: 0.7% UPPER: 6.1%
Combustion Products	These products are toxic carbon oxides (CO, CO ₂).		
Fire Hazards	Not available.		
Explosion Hazards	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.		
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion. Consult with local fire authorities before attempting large scale fire-fighting operations.		

Section VI. Accidental Release Measures

Spill Cleanup Instructions	Carcinogenic material. Combustible liquid. Possible sensitizing material. Environmentally hazardous material. Irritating material. Keep away from heat. Mechanical exhaust required. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. DO NOT touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Consult federal, state, and/or local authorities for assistance on disposal.
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Section VII. Handling and Storage

Handling and Storage Information	CARCINOGEN. COMBUSTIBLE. POSSIBLE SENSITIZER. ENVIRONMENTAL HAZARD. IRRITANT. Keep away from heat. Mechanical exhaust required. Avoid excessive heat and light. Do not breathe gas/fumes/ vapor/spray. Always store away from incompatible compounds such as oxidizing agents.
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Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash station and safety shower is proximal to the work-station location.
Personal Protection	Splash goggles. Lab coat. Vapor respirator. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product. Be sure to use a MSHA/NIOSH approved respirator or equivalent. 
Exposure Limits	This chemical is classified as a carcinogen. There is no acceptable exposure limit for a carcinogen.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Liquid. (Colorless.)	Solubility	Soluble in all proportions in alcohol and ether.
Specific Gravity	0.8402 (water=1) @ 25°C		
Molecular Weight	136.23	Partition Coefficient	K _{ow} = 4.232
Boiling Point	175.5 to 176°C (347.9 to 348.8°F) @ 763mmHg	Vapor Pressure	2.7 kPa (@ 68.2°C)
Melting Point	-74.35 (-101.8°F)	Vapor Density	4.7 (Air = 1)
Refractive Index	1.4743 @ 21°C	Volatility	Not available.
Critical Temperature	Not available.	Odor	Fresh, citrus.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability	This material is stable if stored under proper conditions. (See Section VII for instructions)
Conditions of Instability	Avoid excessive heat and light.
Incompatibilities	Reactive with strong oxidizing agents.

Section XI. Toxicological Information

RTECS Number	GW6360000
Routes of Exposure	Eye Contact. Ingestion. Inhalation.
Toxicity Data	Rat LD ₅₀ (oral) 4400mg/kg Rat LD ₅₀ (intravenous) 110mg/kg Rabbit LD ₅₀ (dermal) >5gm/kg
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Acute Toxic Effects	Skin contact may result in sensitization. Always cover all exposed skin with an impermeable layer and use proper eye protection. A OSHA/MSHA approved dust and vapor respirator is required when working with this material. Irritating to eyes and skin on contact. Inhalation causes irritation of the lungs and respiratory system. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Section XII. Ecological Information

Ecotoxicity	This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment.
Environmental Fate	(D)-Limonene is both a naturally occurring and a synthetically produced terpene which is used in flavors and fragrances, as a solvent and for numerous other commercial uses. If released to soil, (D)-limonene is expected to exhibit low to slight mobility. It is expected to rapidly volatilize from both dry and moist soil to the atmosphere although strong adsorption to soil may attenuate the rate of this process. If released to water, (D)-limonene may bioconcentrate in fish and aquatic organisms and it may significantly adsorb to sediment and suspended organic matter. It is expected to rapidly volatilize from water to the atmosphere. The estimated half-life for volatilization of (D)-limonene from a model river is 3.4 hr, although adsorption to sediment and suspended organic matter may attenuate the rate of this process. If released to the atmosphere, (D)-limonene is expected to rapidly undergo gas-phase oxidation reactions with photochemically produced hydroxyl radicals, ozone, and at night with nitrate radicals. Calculated half-lives for these processes are 2.3-2.6 hr, 25-26 min and 3.1 min, respectively. Occupational exposure to (D)-limonene may occur by inhalation or dermal contact during its production formulation, transport or use. Exposure to the general population may occur by inhalation due to its presence in the atmosphere as a result of released from natural sources or by ingestion of food in which it is contained. (HSDB)

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state and local regulations when disposing of the substance.
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Section XIV. Transport Information

DOT Classification	CLASS 3: Flammable liquid.
PIN Number	UN2319
Proper Shipping Name	Terpene hydrocarbons, n.o.s.
Packing Group (PG)	III
DOT Pictograms	

**Section XV. Other Regulatory Information and Pictograms**

TSCA Chemical Inventory (EPA)	This compound is ON the EPA Toxic Substances Control Act (TSCA) inventory list. On EPA IRIS Database.
WHMIS Classification (Canada)	CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
EINECS Number (EEC)	227-813-5
EEC Risk Statements	R36/37/38- Irritating to eyes, respiratory system and skin. R42/43- May cause sensitization by inhalation and skin contact. R45- May cause cancer. R50- Very toxic to aquatic organisms. R53- May cause long-term adverse effects in the aquatic environment.
Japanese Regulatory Data	Not available.

Section XVI. Other Information

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Notice to Reader

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, household, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.