

1 HEALTH
3 FLAMMABILITY
1 PHYSICAL HAZARD

MATERIAL SAFETY DATA SHEET

Kowa American Corporation

CHEMTREC 24-HOUR EMERGENCY NUMBER (800) 424-9300

SECTION 1

CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Dimethyl carbonate
[DMC]

Distributor's Name and Address in United States: Kowa American Corporation
55 East 59th Street, 19th Floor
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CHEMTREC 24-HOUR Emergency Number: (800) 424-9300

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SECTION 2

COMPOSITION AND INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS Registry No.</u>	<u>Weight %</u>	<u>Exposure Limits</u>
Dimethyl carbonate	616-38-6	99.0% (min.) 99.7% (typ.)	200 ppm TWA ¹
Methanol	67-56-1	< 0.1%	200 ppm TWA (OSHA, ACGIH) (260 mg/m ³)
Water	7732-18-5	< 0.05%	Not Established

Notes on Composition and Information on Ingredients

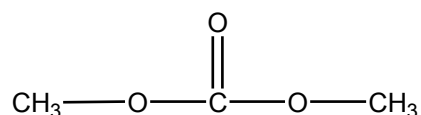
¹ The 200 ppm exposure level is Kowa American's recommended occupational exposure level. This level is based on OSHA's and ACGIH's exposure limit for methanol which is expected to be the primary metabolite of dimethyl carbonate.

OTHER PRODUCT INFORMATION

Chemical Name: Carbonic acid dimethyl ester (9CI)

Synonym: Methyl carbonate

Chemical Structure:



Molecular Formula: C₃H₆O₃

Molecular Weight: 90.1

**SECTION 3
HAZARDS IDENTIFICATION**

*****Emergency Overview*****

Clear colorless liquid with pleasant odor. Highly flammable. Keep container in a well ventilated place. Avoid all ignition sources. No smoking. Wear eye, skin, and respiratory protection. In case of contact with skin or eyes, rinse with water. Overdose or over exposure should be treated as methanol poisoning. Avoid release to the environment. Readily biodegradable. Not expected to bioaccumulate. Partially water-soluble.

POTENTIAL HEALTH EFFECTS

EYES: Slightly irritating to the eyes. More serious effects may result if exposure is not treated. Vapors may irritate eyes.

INHALATION: Vapors may be slightly irritating to the upper respiratory tract (including nasal tissues). Prolonged exposure may be harmful and cause adverse effects including labored breathing and drowsiness, as well as damage to the upper respiratory tract and eyes.

SKIN: Generally not expected to be irritating to the skin. Prolonged or excessive exposure may result in adverse effects. The irritancy of this material varies from person to person.

INGESTION: Oral toxicity of this material is expected to be moderate. Serious adverse effects from over exposure may occur and include central nervous system effects, blindness, and possibly death.

CHRONIC EFFECTS/CARCINOGENICITY: Not regulated as a carcinogen. No long-term chronic effects or carcinogenicity data are known or available on this product.

NTP: *Not listed*

IARC: *Not listed*

OSHA: *Not listed*

MUTAGENICITY: This compound was found to be negative in two *in vitro* mutagenicity assays.

TERATOGENICITY (birth defects): Teratogenic effects were observed at very high doses (3,000 ppm) in one mouse assay. No effects were observed at any of the lower dose levels.

REPRODUCTIVE TOXICITY: No reproductive data are available on this material.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

INCOMPATIBILITY: Not known.

SIGNS AND SYMPTOMS OF EXPOSURE: Slight eye and respiratory tract irritation; labored breathing and drowsiness; loss of coordination possible if exposed to high concentrations.

SECTION 4 FIRST AID MEASURES

FIRST AID MEASURES

SKIN: Wash with plenty of water, then with soap and water for 15 minutes. Discard contaminated clothing and shoes. Call physician immediately if exposed to large quantities and/or if contact is prolonged.

EYES: Immediately flush with a continuous water stream for at least 20 minutes. Washing immediately after exposure is expected to be effective in preventing damage to the eyes. Get immediate medical attention.

INHALATION: Remove to fresh air. If not breathing give artificial respiration. If there is breathing difficulty, give oxygen. Get immediate medical attention.

INGESTION/SWALLOWED: Do not induce vomiting. Dilute by giving 1 or 2 glasses of milk or water. Nothing by mouth if unconscious. Get immediate medical attention.

NOTE TO HEALTH CARE PROFESSIONALS: Overdose or over exposure to this material should be treated as methanol poisoning since methanol is expected to be the primary metabolite of this product.

SECTION 5 FIRE FIGHTING MEASURES

FLASH POINT: 63 °F / 17 °C [closed cup]

EXPLOSION/FLAMMABLE LIMITS: Not known

AUTOIGNITION TEMPERATURE: 458 °C

EXTINGUISHING MEDIA: Use dry chemical, foam, carbon dioxide, and water spray/fog as needed. For large fires alcohol resistant foams are preferred.

SPECIAL FIRE FIGHTING PROCEDURES: This material is highly flammable. As in any fire, wear a self-contained breathing apparatus pressure demand (MSHA/NIOSH approved or equivalent) and full protective gear. Toxic vapors may evolve. Fight fires from a safe distance or protected areas. Fire hoses with fog nozzles may be used for controlling fires. Use of large volumes of water may produce run-off that could be harmful to aquatic life and/or pose a hazardous waste disposal problem. This substance is partially water-soluble and therefore the use of water during fire fighting is expected to be relatively effective. Water will dilute the compound, without the formation of an appreciable surface slick, and is not expected to spread flaming.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This material is highly flammable. Sealed containers can explode in the heat of fire. Vapors may travel to ignition source. Run off may create an explosion, fire, and environmental hazard.

SECTION 6 ACCIDENTAL RELEASE MEASURES

SPILL/RELEASE AND CLEANUP PROCEDURES: In case of spill, evacuate the area and remove all ignition sources. Dike and contain spill with vermiculite, clay-based absorbents, or other absorbent materials such as polyethylene fiber and polypropylene fiber products. Do not discharge the washings and other effluents into ponds, streams, or lakes. Wear appropriate respiratory and protective clothing as described in Section 8 during any cleanup and response activities. In the event of an uncontrolled release of this material, the user should determine if the release is reportable under applicable laws and regulations. This substance is partially water-soluble and is not expected to form an appreciable surface slick.

SECTION 7 HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: This material must be stored in an area free of heat and all ignition sources. Store in a cool dry place.

OTHER PRECAUTIONS: Do not drop. Keep away from fire, heat, open flames, lights, and all other ignition sources. Wear goggles and gloves when handling. Avoid breathing vapors. Eye-wash stations and emergency showers need to exist in areas where the material is handled, especially areas where loading and unloading operations occur. Wash hands thoroughly after handling and before eating, drinking, or smoking. Keep out of reach of children. Ground all containers when transferring the material.

Do not contaminate water, food, or feed by storage or disposal. Keep the product in original containers. Store in cool, dry, well ventilated, low fire risk area away from sunlight. Keep containers closed. Store only in approved containers, under approved conditions. Avoid pressure build-up in containers. An automatic water spray device should be immediately available. A spill control and containment plan should be provided. Storage area should not be subject to rapid temperature changes as such changes may cause increased internal pressure. Isolate from toxic materials or substances that may release corrosive, toxic, or flammable fumes on reaction.

SECTION 8 EXPOSURE CONTROLS AND PERSONNEL PROTECTION

RESPIRATORY PROTECTION: Respirators equipped with organic vapor cartridges are anticipated to provide adequate respiratory protection during short-term exposures to low vapor concentrations of the material. Workers should wear a supplied-air respirator or self-contained breathing apparatus any time exposure is above low levels or during extended exposure periods. Use MSHA/NIOSH-approved respiratory equipment. Respirators should be selected based on the form and concentration of the contaminant in the air and in accordance with OSHA (29 CFR 1910.134). Handle only in the presence of adequate ventilation.

PROTECTIVE GLOVES: Wear chemical resistant gloves appropriate to the conditions to prevent skin exposure. Gloves made of **BUTYL RUBBER** are anticipated to afford adequate hand protection. (Gloves made of PVC, nitrile, and neoprene may not provide adequate hand protection.) Rinse and remove gloves immediately after use, and wash hands thoroughly with soap and water. Gloves should be removed and replaced immediately if there are any signs of degradation or breakthrough.

PROTECTIVE CLOTHING: Wear protective clothing and boots impervious to the product for the duration of the anticipated exposure if there is a potential for skin contact. An emergency shower should be readily accessible. Discard any contaminated clothing.

EYE PROTECTION: Chemical safety goggles meeting the specifications of ANSI Standard Z87.1 should be worn whenever there is the possibility of contact with the eyes. Spectacle type safety glasses do not provide satisfactory protection. An eyewash fountain should be readily accessible. Wear plastic face shield in addition to safety goggles where there is a danger of splashing.

AIR MONITORING: No information is available.

EXPOSURE GUIDELINES: No exposure guidelines have been established for this substance by OSHA, ACGIH, or NIOSH. The 200 ppm exposure level is Kowa American recommends an occupational exposure level over an 8-hour TWA. This level is based on OSHA's and ACGIH's exposure limit for methanol which is expected to be the primary metabolite of dimethyl carbonate.

SECTION 9
PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear colorless liquid
Odor:	Pleasant odor
Boiling Point:	90 °C (760 mm Hg)
Specific Gravity:	1.0706 (20 °C)
Vapor Pressure:	42 mm Hg (20 °C) 55 mm Hg (25 °C)
Refractive Index (n_D):	1.3687 (20 °C)
Acidity (pH):	6.4 - 6.8
Viscosity:	0.625 cps (20 °C)
Freezing Point:	2 - 4 °C
Solubility in Water:	13.9 g/100 g water
Color (APHA):	≤ 20
Surface Tension:	3.1925 x 10 ⁻² N/m
Volatile (%):	100%

Notes on Physical and Chemical Properties

None

SECTION 10
STABILITY AND REACTIVITY

STABILITY: Stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, fire, open flames, direct light, ignition sources, and UV radiation.

INCOMPATIBILITY/MATERIALS TO AVOID: Oxidizing and reducing agents.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Not expected under normal conditions.

HAZARDOUS POLYMERIZATION: Hazardous polymerization will not occur.

**SECTION 11
TOXICOLOGICAL INFORMATION**

ACUTE TOXICOLOGICAL DATA:

Test	Result
Oral Rat LD ₅₀	12,900 mg/kg
Oral Mouse LD ₅₀	6,000 mg/kg
Dermal Rat LD ₅₀	> 2,500 mg/kg
Dermal Rabbit LD ₅₀	5,000 mg/kg
Inhalation Rat LD ₅₀	> 140 mg/liter
IP Mouse LD ₅₀	800 - 1,600 mg/kg

OTHER ACUTE DATA: Rats exposed to up to 5,000 mg/kg showed clinical signs of hypoactivity, ataxia, redness around the eyes and nose, and loss of righting reflex. Duration of exposure was not reported. Separately, the primary expected metabolite of this compound is expected to be methanol. Methanol has been shown to be poorly tolerated in man with over exposure resulting in serious effects including central nervous system effects, blindness, and possibly death. These adverse effects have been reported even at low levels of methanol exposure.

EYE IRRITATION DATA: This compound produced slight eye irritation when tested in rabbits.

SKIN IRRITATION DATA: This compound did not cause skin irritation when tested in rats and rabbits.

SKIN SENSITIZATION DATA: No data are available.

SUBCHRONIC DATA: No data are available.

REPRODUCTIVE TOXICITY: No data are available.

TERATOGENICITY (birth defects): Pregnant female CD-1 mice were exposed by inhalation to 0, 300, 1000, or 3000 ppm during gestational days (GD) 6 through 15. Maternal body weights, clinical observations, and food consumption were recorded throughout gestation. At scheduled euthanization on GD 18, fetuses were weighed, sexed, and examined for external, visceral, and skeletal alterations. There were no treatment-related deaths or clinical findings. Maternal body weights and body weight gains were significantly reduced at 3000 ppm. Food consumption was also significantly reduced in the 1000 and 3000 ppm groups. Gestational parameters affected at 3000 ppm included post-implantation loss due to increased resorptions and altered sex ratio (decreased males). Fetal body weights per litter were reduced at 3000 ppm, with increased number of stunted fetuses. Total incidences of fetal malformations (external, visceral, and skeletal) were significantly increased at 3000 ppm and included cleft palate, microtia, low set ears, multiple skull bone malformations, and fused vertebral arches. There was also a treatment-related increase in skeletal variations at 3000 ppm. The NOEL for maternal and developmental toxicity was 1000 ppm.

MUTAGENICITY: This compound was found to be negative in the *in vitro* Ames test. The compound was also negative in the Comet Assay which evaluates DNA damage and repair at the cellular level. There are no *in vivo* mutagenicity data on this compound.

CHRONIC EFFECTS/CARCINOGENICITY: No data are available.

SECTION 12 ECOLOGICAL INFORMATION
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SUMMARY OF ECOLOGICAL DATA: Not expected to be toxic to fish, Daphnia, or bacteria. Modeling data suggest that this compound may be harmful, possibly toxic, to algae. Low potential to bioaccumulate; readily biodegradable.

ECOTOXICOLOGICAL DATA:

Test	Result
Fish NOEC ₅₀ 96-hour [OECD 203]	1,000 mg/liter
Daphnia LC ₅₀ 48-hour [estimated by model]	2,920 mg/liter
Algae EC ₅₀ 96-hour [estimated by model]	9 mg/liter
Bacteria EC ₅₀ [OECD 209]	> 1,000 mg/liter

ENVIRONMENTAL FATE DATA: This compound was found to be greater than 90% biodegradable after 28 days under OECD 301C. The BCF is estimated to be 3.16 and as such is not expected to bioaccumulate. Distribution in the environment is expected to be roughly equal across water, air, and soil media with half-lives on the order of hundreds of hours.

PHYSICAL/CHEMICAL PROPERTIES: The computer-modeled Log K_{ow} was found to be 0.23. The Henry's Law constant is modeled to be 6.2×10^{-4} atm · m³/mol. Partially soluble in water. The computer-modeled k_{oc} is predicted to be 8.25.

SECTION 13 DISPOSAL CONSIDERATIONS

RCRA CLASSIFICATION: If discarded in its manufactured form, this product is a characteristic hazardous waste under RCRA. However, it is the responsibility of the user to determine at the time of disposal whether a material containing the product or derived from the product should be classified as a hazardous waste.

SPECIAL INSTRUCTIONS: Do not discharge effluent containing this product into municipal sewers or open bodies of water. This material is soluble in water. This substance may be a characteristic hazardous waste under RCRA. All recovered material should be packaged, labeled, transported, and disposed of in conformance with applicable laws and regulations. Incinerate the wastes in an approved facility that complies with local, state, and federal regulations. For disposing of the container, completely empty the container. Rinse empty container with water and dispose of the container in a sanitary landfill or by incineration.

SECTION 14 TRANSPORT INFORMATION

U.S./INTERNATIONAL SHIPPING INFORMATION UNDER DOT, IMO/IMDG, ICAO, IATA, AND UN REGULATIONS:

Label/Placard:	Flammable liquid
Proper Shipping Name:	Dimethyl carbonate
Hazard Class:	Class 3, Packaging Group II
UN or ID No.:	UN 1161

Notes on Transport Information

None

SECTION 15
REGULATORY INFORMATION

REGULATORY STATUS: All chemical substances contained within this product either are listed on the Toxic Substances Control Act (TSCA) Chemical Substance Inventory or exempt under TSCA. The chemical substances contained within this product, including its impurities, may be subject to specific reporting/notification, recordkeeping, and/or testing requirements under: TSCA, EPCRA/SARA III, RCRA, CERCLA, CAA, SDWA, and CWA.

The table below shows the international chemical inventory status of DMC:

<u>Country</u>	<u>Inventory</u>	<u>Listed</u>	<u>Not Listed</u>	<u>Notes</u>
Australia	AICS	√		
Canada	DSL	√		
	NDSL			Not applicable
China	IECS	√		
European Union	REACH	√		Intermediate List of Pre-Registered Substances
Japan	ENCS	√		2-2853
New Zealand	NZIoC	√		HSNO approval
Philippines	PICCS	√		
South Korea	ECL	√		KE-11278
U.S.	TSCA	√		

EPCRA SECTION 313 SUPPLIER NOTIFICATION: This product contains no chemicals at or above *de-minimis* levels subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act.

CALIFORNIA PROPOSITION 65: This compound contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

STATUS UNDER THE CLEAN AIR ACT: Under the Clean Air Act, DMC is no longer regulated by the U.S. Environmental Protection Agency as a volatile organic compound (VOC) for purposes of meeting the national ambient air quality standard for ozone. 74 Fed. Reg. 3437; January 21, 2009. The link for this rule is available at: <http://edocket.access.gpo.gov/2009/pdf/E9-1150.pdf>.

Depending on the individual state, the VOC excluded status of DMC may be automatically added to a state's list of VOC excluded compounds or may require that a state take specific action to add the compound. (California must specifically add DMC to its list of VOC excluded compounds.) To determine the status of DMC in each state, visit the National Association of Clean Air Agencies (NACAA) website which identifies the proper contact person for each state: <http://www.4cleanair.org/>. In addition, DMC is not regulated as a hazardous air pollutant (HAP) or ozone depleting substance (ODS).

The table below provides the Maximum Incremental Reactivity (MIR) values for DMC and three other VOC exempt compounds, methyl acetate, ethane, and acetone.

Table of MIR Values

	DMC	Methyl acetate	Ethane	Acetone
grams ozone / grams VOC	0.056	0.068	0.27	0.35
grams ozone / moles VOC	5.045	5.037	8.12	20.33

**SECTION 16
OTHER INFORMATION**

DISCLAIMER: The information presented herein is believed to be factual. However, none of this information is to be taken as a warranty or representation for which Kowa American Corporation, its affiliates, the chemical manufacturer, or the preparer bears legal responsibility. The user should review any recommendation in the specific context of the intended use to determine whether it is appropriate.