MATERIAL SAFETY DATA SHEET

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Section 1 - Product and Company Information

Product Name	METHYLISOCYANATE, 1 X 500MG, NEAT
Product Number	O2179
Brand	SUPELCO
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
METHYL ISOCYANATE	624-83-9	Yes

Ingredient Name	CAS #	Percent	SARA 313
HYDROCHLORIC ACID	7647-01-0	0.1	No

Formula: C2H3NO

Synonyms: Isocyanate de methyle (French) * Iso-cyanatomethane * Methylisocyanaat (Dutch) * Methyl isocyanat (German) * Methyl isocyanate (ACGIH:OSHA) * Methylisokyanat (Czech) * Metil isocianato (Italian) * RCRA waste number P064 * TL 1450

RTECS Number: NQ9450000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable (USA) Extremely Flammable (EU). Highly Toxic (USA) Very Toxic (EU).

Toxic in contact with skin and if swallowed. Very toxic by inhalation. Irritating to respiratory system and skin. Risk of serious damage to eyes. May cause sensitization by inhalation and skin contact. Possible risk of harm to the unborn child. Lachrymator. Readily absorbed through skin. Target organ(s): Eyes. Lungs. Reacts violently with water.

HMIS RATING

HEALTH: 4*
FLAMMABILITY: 4
REACTIVITY: 3
SPECIAL HAZARD(S): Water reactive

NFPA RATING

HEALTH: 4
FLAMMABILITY: 4
REACTIVITY: 3
SPECIAL HAZARD(S): Water reactive

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

FLASH POINT
20 ˚F - 7.0 ˚C Method: closed cup

EXPLOSION LIMITS
Lower: 5.3 % Upper: 26 %

AUTOIGNITION TEMP
534 ˚C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide. Dry chemical powder. Appropriate foam.
Unsuitable: Do not use water.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Extremely flammable. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition. Use nonsparking tools.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame. Handle and store under nitrogen.
Incompatible Materials: Do not allow contact with water

SPECIAL REQUIREMENTS
May develop pressure. Open carefully. Stainless steel only.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use nonsparking tools. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Remove and wash contaminated clothing promptly. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	0.02 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	0.02 PPM (0.05 MG/M3) (SKIN)
USA	OSHA.	PEL	8H TWA 0.02 PPM (0.05 MG/M3) (
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	0.02 PPM (SK)

Section 9 - Physical/Chemical Properties

Appearance Physical State: Liquid

Property	Value	At Temperature or Pressure
Molecular Weight	57.05 AMU	
pH	N/A	

BP/BP Range	37.0 - 39.0 ˚C	760 mmHg
MP/MP Range	- 17.0 ˚C	
Freezing Point	N/A	
Vapor Pressure	403.26 mmHg	20 ˚C
Vapor Density	2 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.967 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	20 ˚F - 7.0 ˚C	Method: closed cup
Explosion Limits	Lower: 5.3 % Upper: 26 %	
Flammability	N/A	
Autoignition Temp	534 ˚C	
Refractive Index	1.37	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Conditions to Avoid: Heat. Depletion of inhibitor
Materials to Avoid: Reacts violently with water., Strong acids, Strong bases, Strong oxidizing agents, Alcohols, Amines, Steel Iron and iron salts., Zinc, Tin/tin oxides, Copper, and their alloys

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Nitrogen oxides, Hydrogen cyanide.

STABILIZERS PRESENT

Stabilized to prevent spontaneous polymerization.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: Causes skin irritation.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes severe eye irritation. Lachrymator.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be fatal if inhaled.
Ingestion: Toxic if swallowed.

SENSITIZATION

Respiratory: May cause allergic respiratory reaction.
Skin: May cause allergic skin reaction.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Lungs. Kidneys. Eyes.

SIGNS AND SYMPTOMS OF EXPOSURE
Exposure can cause: Damage to the eyes. Lung irritation, chest pain, and edema which may be fatal. Repeated exposure may cause asthma. As a result of an accidental chemical release exposure to humans in India, Methyl Isocyanate is associated with increases in miscarriages among pregnant women. There is limited evidence that chronic exposure to this compound may damage the developing fetus and may decrease fertility in males and females. Experimental animal studies demonstrated that this compound crossed the placenta and entered the fetus. Scientific studies on a small human population accidentally exposed to Methyl Isocyanate have exhibited an increased incidence of chromosomal abnormalities. Experimental animal studies have supported this observation.

TOXICITY DATA

Oral
Rat
51.5 mg/kg
LD50
Remarks: Peripheral Nerve and Sensation:Flaccid paralysis without anesthesia (usually neuromuscular blockage). Lungs, Thorax, or Respiration:Respiratory depression. Behavioral:Somnolence (general depressed activity).

Inhalation
Rat
6100 PPB/6H
LC50
Remarks: Lungs, Thorax, or Respiration:Dyspnea. Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation.

Skin
Rat
2780 mg/kg
LD50

Subcutaneous
Rat
261 MG/KG
LD50
Remarks: Lungs, Thorax, or Respiration:Respiratory depression. Behavioral:Somnolence (general depressed activity). Peripheral Nerve and Sensation:Flaccid paralysis without anesthesia (usually neuromuscular blockage).

Oral
Mouse
120 mg/kg
LD50

Inhalation
Mouse
12200 PPB/6H
LC50

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Lungs, Thorax, or Respiration:Dyspnea.

Skin
Mouse
1820 mg/kg
LD50

Subcutaneous
Mouse
81900 UG/KG
LD50
Remarks: Peripheral Nerve and Sensation:Flaccid paralysis without anesthesia (usually neuromuscular blockage). Behavioral:Somnolence (general depressed activity). Lungs, Thorax, or Respiration:Respiratory depression.

Skin
Rabbit
220 UL/KG
LD50
Remarks: Skin and Appendages:Skin: After systemic exposure: Dermatitis, other

Subcutaneous
Rabbit
126 MG/KG
LD50

Inhalation
Guinea pig
5400 PPB/6H
LC50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Lungs, Thorax, or Respiration:Dyspnea.

IRRITATION DATA

Skin
Rabbit
0.01 ml
24H
Remarks: Moderate irritation effect

Eyes
Rabbit
0.005 ml
24H
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IRIS/EPA CARCINOGEN LIST
Rating: Group D
Species: rat, male

CHRONIC EXPOSURE - TERATOGEN
Result: Possible risk of congenital malformation in the fetus.

CHRONIC EXPOSURE - MUTAGEN

Species: Mouse
Route: Inhalation
Dose: 6 PPM
Exposure Time: 6H/4D
Mutation test: Micronucleus test

Species: Mouse
Route: Inhalation
Dose: 3 PPM
Exposure Time: 6H/4D
Mutation test: Other mutation test systems

Species: Mouse
Route: Inhalation
Dose: 3 PPM
Exposure Time: 6H/4D
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Inhalation
Dose: 1 PPM
Exposure Time: 6H/4D
Mutation test: Sister chromatid exchange

Species: Mouse
Dose: 8 UMOL/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 10100 UG/L
Cell Type: ovary
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 900 UG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 9 PPM/3H
Route of Application: Inhalation
Exposure Time: (10D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 9 PPM/3H
Route of Application: Inhalation
Exposure Time: (8D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse

Dose: 9 PPM/3H
Route of Application: Inhalation
Exposure Time: (8D PREG)
Result: Effects on Fertility: Litter size (e.g.; # fetuses per litter; measured before birth). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 9 PPM/3H
Route of Application: Inhalation
Exposure Time: (1D PREG)
Result: Paternal Effects: Other effects on male. Effects on Fertility: Mating performance (e.g., # sperm positive females per # females mated; # copulations per # estrus cycles).

Species: Mouse
Dose: 1 PPM/6H
Route of Application: Inhalation
Exposure Time: (14-17D PREG)
Result: Effects on Newborn: Stillbirth.

Species: Mouse
Dose: 3 PPM/6H
Route of Application: Inhalation
Exposure Time: (14-17D PREG)
Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4). Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive).

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Methyl isocyanate
UN#: 2480
Class: 6.1
Packing Group: Packing Group I
Hazard Label: Poison inhalation hazard
Hazard Label: Flammable liquid
PIH: ZONE A

IATA
Proper Shipping Name: Methyl isocyanate
IATA UN Number: 2480
Hazard Class: 3
Packing Group: I
Not Allowed - Aircraft: Not permitted for air transport.

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: F+-T+
Indication of Danger: Extremely Flammable. Very toxic.
R: 12-24/25-26-37/38-41-42/43-63
Risk Statements: Extremely flammable. Toxic in contact with skin and if swallowed. Very toxic by inhalation. Irritating to respiratory system and skin. Risk of serious damage to eyes. May cause sensitization by inhalation and skin contact. Possible risk of harm to the unborn child.
S: 26-27-28-36/37/39-45-63
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Take off immediately all contaminated clothing. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). In case of accident by inhalation: remove casualty to fresh air and keep at rest.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable (USA) Extremely Flammable (EU). Highly Toxic (USA) Very Toxic (EU).
Risk Statements: Toxic in contact with skin and if swallowed. Very toxic by inhalation. Irritating to respiratory system and skin. Risk of serious damage to eyes. May cause sensitization by inhalation and skin contact. Possible risk of harm to the unborn child.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Take off immediately all contaminated clothing. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). In case of accident by inhalation: remove casualty to fresh air and keep at rest.
US Statements: Lachrymator. Readily absorbed through skin.
Target organ(s): Eyes. Lungs. Reacts violently with water.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: Yes

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The

information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.