

2-Hydroxyethyl methacrylate

sc-238082

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

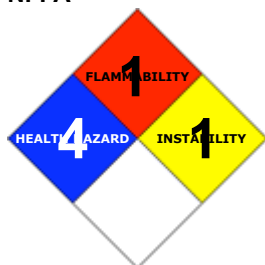
PRODUCT NAME

2-Hydroxyethyl methacrylate

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY:

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C₆H₁₀O₃, CH₂=C(CH₃)CO₂CH₂, "ethylene glycol methacrylate", "ethylene glycol monomethacrylate", "glycol methacrylate", "glycol monomethacrylate", "2-hydroxy ethylmethacrylate", "beta-hydroxyethyl methacrylate", "1, 2-ethanediol mono(2-methylpropenoate)", "monomethacrylic ether of ethylene glycol", "methacrylic acid, 2-hydroxyethyl ester", Mhoromer, "Monomer MG-1"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	2		
Body Contact:	2		
Reactivity:	1		
Chronic:	2		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

May cause SENSITISATION by skin contact.
Irritating to eyes, respiratory system and skin.
Vapours may cause drowsiness and dizziness.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be damaging to the health of the individual.
- Central nervous system (CNS) depression may include general discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

EYE

- This material can cause eye irritation and damage in some persons.

SKIN

- This material can cause inflammation of the skin on contact in some persons.
- The material may accentuate any pre-existing dermatitis condition.
- Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

- The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
- Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.
- Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.
- Inhalation hazard is increased at higher temperatures.
- Inhalation of high concentrations of gas/vapor causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population. Sensitization may give severe responses to very low levels of exposure, i.e. hypersensitivity.

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Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
2-hydroxyethyl methacrylate	868-77-9	>95
Residual reactants as		
methacrylic acid	79-41-4	1
4-methoxyphenol (MEHQ)	150-76-5	0.11
ethylene oxide	75-21-8	0.001

Section 4 - FIRST AID MEASURES

SWALLOWED

· If swallowed do NOT induce vomiting. · If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

EYE

■ If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0.01 @ 25C
Upper Explosive Limit (%):	Not available
Specific Gravity (water=1):	1.07
Lower Explosive Limit (%):	Not available

EXTINGUISHING MEDIA

· Water spray or fog.
· Foam.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Combustible.
· Slight fire hazard when exposed to heat or flame.
Combustion products include: carbon dioxide (CO₂), nitrogen oxides (NO_x), other pyrolysis products typical of burning organic material.
May emit clouds of acrid smoke.
May emit poisonous fumes.
May emit corrosive fumes.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Type AX Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

· Remove all ignition sources.
· Clean up all spills immediately.

MAJOR SPILLS

■ Moderate hazard.
· Clear area of personnel and move upwind.
· Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

· Most acrylic monomers have low viscosity therefore pouring, material transfer and processing of these materials do not necessitate heating.
· Viscous monomers may require heating to facilitate handling. To facilitate product transfer from original containers, product must be heated to no more than 60 deg. C. (140 F.), for not more than 24 hours.
· DO NOT allow clothing wet with material to stay in contact with skin.
· Avoid all personal contact, including inhalation.
· Wear protective clothing when risk of exposure occurs.
Clothing wet with the material can be a fire hazard and should be removed promptly.

RECOMMENDED STORAGE METHODS

· Metal can or drum
· Packing as recommended by manufacturer.

STORAGE REQUIREMENTS

■ Polymerization may occur slowly at room temperature.

- Store in original containers.
 - Keep containers securely sealed.
 - No smoking, naked lights or ignition sources.
 - Store in a cool, dry, well-ventilated area.
 - Store away from incompatible materials and foodstuff containers.
 - Protect containers against physical damage and check regularly for leaks.
 - Observe manufacturer's storing and handling recommendations.
- WARNING: Gradual decomposition in strong, sealed containers may lead to a large pressure build-up and subsequent explosion.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	Notes
Canada - British Columbia Occupational Exposure Limits	methacrylic acid (Methacrylic acid)	20						
Canada - Ontario Occupational Exposure Limits	methacrylic acid (Methacrylic acid)	20	70					
US ACGIH Threshold Limit Values (TLV)	methacrylic acid (Methacrylic acid)	20						TLV Basis: skin & eye irritation
US NIOSH Recommended Exposure Limits (RELs)	methacrylic acid (Methacrylic acid)	20	70					[skin]
US - Minnesota Permissible Exposure Limits (PELs)	methacrylic acid (Methacrylic acid)	20	70					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	methacrylic acid (Methacrylic acid)	20	70					
US - California Permissible Exposure Limits for Chemical Contaminants	methacrylic acid (Methacrylic acid)	20	70					
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	methacrylic acid (Methacrylic acid)	20	70					
US - Hawaii Air Contaminant Limits	methacrylic acid (Methacrylic acid)	20	70					
US - Alaska Limits for Air Contaminants	methacrylic acid (Methacrylic acid)	20	70					
US - Washington Permissible exposure limits of air contaminants	methacrylic acid (Methacrylic acid)	20		30				
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	methacrylic acid (Methacrylic acid)	20		30				

US - Michigan Exposure Limits for Air Contaminants	methacrylic acid (Methacrylic acid)	20	70			
Canada - Prince Edward Island Occupational Exposure Limits	methacrylic acid (Methacrylic acid)	20				TLV Basis: skin & eye irritation
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	methacrylic acid (Methacrylic acid)	20	70			
Canada - Northwest Territories Occupational Exposure Limits (English)	methacrylic acid (Methacrylic acid)	20	70	30	105	
Canada - Nova Scotia Occupational Exposure Limits	methacrylic acid (Methacrylic acid)	20				TLV Basis: skin & eye irritation
Canada - Ontario Occupational Exposure Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - Minnesota Permissible Exposure Limits (PELs)	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
Canada - Alberta Occupational Exposure Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
Canada - British Columbia Occupational Exposure Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - California Permissible Exposure Limits for Chemical Contaminants	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US NIOSH Recommended Exposure Limits (RELs)	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - Michigan Exposure Limits for Air Contaminants	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US - Washington Permissible exposure limits of air contaminants	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5		10	

Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5		10	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			
US ACGIH Threshold Limit Values (TLV)	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			TLV Basis: eye irritation; skin damage
Canada - Nova Scotia Occupational Exposure Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			TLV Basis: eye irritation; skin damage
Canada - Prince Edward Island Occupational Exposure Limits	4-methoxyphenol (MEHQ) (4-Methoxyphenol)		5			TLV Basis: eye irritation; skin damage
Canada - Alberta Occupational Exposure Limits	ethylene oxide (Ethylene oxide)	1	1.8			
Canada - British Columbia Occupational Exposure Limits	ethylene oxide (Ethylene oxide)	0.1		1		A2, 1; R
US OSHA Permissible Exposure Levels (PELs) - Table Z1	ethylene oxide (Ethylene oxide; see 1910.1047)	1		5		(STEL (Excursion limit)(as averaged over a sampling period of 15 minutes))
US ACGIH Threshold Limit Values (TLV)	ethylene oxide (Ethylene oxide)	1				TLV Basis: cancer; central nervous system impairment
US NIOSH Recommended Exposure Limits (RELs)	ethylene oxide (Ethylene oxide)	<0.1	0.18		5	9
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	ethylene oxide (ETHYLENE OXIDE)	0.09				
US - California Permissible Exposure Limits for Chemical Contaminants	ethylene oxide (Ethylene oxide; see Section 5220)	1	2	5		
US - Hawaii Air Contaminant Limits	ethylene oxide (Ethylene oxide)	1				See *12-202-35
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	ethylene oxide (Ethylene oxide)	50	90	75	135	
US - Washington Permissible exposure limits of air contaminants	ethylene oxide (Ethylene oxide (see chapter 296-855 WAC))	1		5		

Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	ethylene oxide (Ethylene oxide)	1		2		T20
US - Michigan Exposure Limits for Air Contaminants	ethylene oxide (Ethylene oxide; see R 325.51151 et seq.F)	1	1.8	5	9.0	
Canada - Prince Edward Island Occupational Exposure Limits	ethylene oxide (Ethylene oxide)	1				TLV Basis: cancer; central nervous system impairment
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	ethylene oxide (Ethylene oxide; see 1910.1047)	1				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	ethylene oxide (Ethylene oxide)	1	1.8			
US - Oregon Permissible Exposure Limits (Z-1)	ethylene oxide (Ethylene oxide)	1				TWA (See 1910.1047)
Canada - Northwest Territories Occupational Exposure Limits (English)	ethylene oxide (Ethylene oxide)	10	20	50	100	
Canada - Nova Scotia Occupational Exposure Limits	ethylene oxide (Ethylene oxide)	1				TLV Basis: cancer; central nervous system impairment
ENDOELTABLE						
The following materials had no OELs on our records						
• 2-hydroxyethyl methacrylate: CAS:868-77-9						

PERSONAL PROTECTION



RESPIRATOR

Type AX Filter of sufficient capacity
Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

■ NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

General warning: Do NOT use latex gloves! Use only recommended gloves - using the wrong gloves may increase the risk:

Exposure condition Short time use; (few minutes less than 0.5 hour) Little physical stress	Use of thin nitrile rubber gloves: Nitrile rubber (0.1 mm) Excellent tactility ("feel"), powder-free Disposable Inexpensive Give adequate protection to low molecular weight acrylic monomers
Exposure condition Medium time use; less than 4 hours Physical stress (opening drums, using tools, etc.)	Use of medium thick nitrile rubber gloves Nitrile rubber, NRL (latex) free; <0.45 mm Moderate tactility ("feel"), powder-free Disposable Moderate price Gives adequate protection for most acrylates up to 4 hours Do NOT give adequate protection to low molecular weight monomers at exposures longer than 1 hour
Exposure condition Long time Cleaning operations	Nitrile rubber, NRL (latex) free; >0.56 mm low tactility ("feel"), powder free High price Gives adequate protection for most acrylates in combination with commonly used solvents up to 8 hours Do NOT give adequate protection to low molecular weight monomers at exposures longer than 1 hour Avoid use of ketones and acetates in wash-up solutions.

Where none of this gloves ensure safe handling (for example in long term handling of acrylates containing high levels of acetates and/ or ketones, use laminated multilayer gloves.

Guide to the Classification and Labelling of UV/EB Acrylates Third edition, 231 October 2007 - Cefic.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

ENGINEERING CONTROLS

■ CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.

Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Mixes with water.

State	Liquid	Molecular Weight	130
Melting Range (°F)	Not available	Viscosity	Not Available
Boiling Range (°F)	140 @ 0.13 kPa	Solubility in water (g/L)	Miscible
Flash Point (°F)	213.8 (SFCC)	pH (1% solution)	Not available
Decomposition Temp (°F)	Not available	pH (as supplied)	5
Autoignition Temp (°F)	Not available	Vapor Pressure (mmHg)	0.01 @ 25C
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.07
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	5.0
Volatile Component (%vol)	100	Evaporation Rate	<1 BuAc=1

APPEARANCE

Clear colourless liquid with penetrating ester odour; mixes with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Stable under controlled storage conditions provided material contains adequate stabilizer / polymerization inhibitor.
- Bulk storages may have special storage requirements.
- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

■ For acrylic and methacrylic acid esters:

- Avoid contact with strong acids, strong alkalies, oxidising agents, polymerisation initiators (peroxides, persulfates), iron or rust
 - Avoid heat, flame, sunlight, x-rays or ultra-violet radiation.
 - Polymerisation may occur at elevated temperature and in presence of ignition sources - polymerisation of large quantities may be violent (even explosive).
 - Store below 38 deg. C.
 - Stable under controlled storage conditions provided material contains adequate stabilizer / polymerization inhibitor.
 - Bulk storages may have special storage requirements.
- Contamination with polymerization catalysts - peroxides, persulfates, oxidizing agents - also strong acids, strong alkalies, will cause polymerization with exotherm - generation of heat.
Polymerization of large quantities may be violent - even explosive.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

2-HYDROXYETHYL METHACRYLATE

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 5050 mg/kg	Eye (rabbit): SEVERE *
Intraperitoneal (Mouse) LD50: 497 mg/kg post-exposure	
Oral (Guinea pig) LD50: 4680 mg/kg	Skin (rabbit): non-irritating*
Intraperitoneal (Rat) LD50: 1250 mg/kg * Rohm & Haas	
Oral (Mouse) LD50: 3275 mg/kg	

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.

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Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Where no "official" classification for acrylates and methacrylates exists, there has been cautious attempts to create classifications in the absence of contrary evidence. For example

Monoalkyl or monoarylesters of acrylic acids should be classified as R36/37/38 and R51/53

Monoalkyl or monoaryl esters of methacrylic acid should be classified as R36/37/38.

Based on the available oncogenicity data and without a better understanding of the carcinogenic mechanism the Health and Environmental Review Division (HERD), Office of Toxic Substances (OTS), of the US EPA previously concluded that all chemicals that contain the acrylate or methacrylate moiety ($\text{CH}_2=\text{CHCOO}$ or $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}$) should be considered to be a carcinogenic hazard unless shown otherwise by adequate testing.

This position has now been revised and acrylates and methacrylates are no longer de facto carcinogens.

Dermal (rabbit): >5000 mg/kg* Effects persist beyond 21 days

ETHYLENE OXIDE:

METHACRYLIC ACID:

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

4-METHOXYPHENOL (MEHQ):

METHACRYLIC ACID:

■ The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

TOXICITY	IRRITATION
METHACRYLIC ACID:	
Oral (rat) LD50: 1060 mg/kg	Nil Reported

Oral (mouse) LD50: 1332 mg/kg

Intraperitoneal (mouse) LD50: 48 mg/kg

Oral (rabbit) LD50: 1200 mg/kg

Dermal (rabbit) LD50: 500 mg/kg

Skin (g.pig) LD50: 1000 mg/kg

■ For methacrylic acid (MAA):

Acute toxicity: MAA is rapidly absorbed in rats after oral and inhalation administration. Oral LD50 values of 1320-2260 mg/kg for rats, a dermal LD50 value between 500 and 1000 mg/kg for rabbits and a LC50 (rat) of 7.1 mg/l/4h were determined. The main clinical sign in animal tests on acute toxicity of MAA is severe irritancy at the site of contact. MAA causes adverse effects at the site of application, depending on the concentration and frequency or time of exposure. The undiluted acid causes skin and eye corrosion and respiratory tract lesions.

MAA is not sensitising as demonstrated by human experience and by animal tests.

Repeat dose toxicity: The main effect of MAA in acute and subchronic animal studies is irritation/corrosivity at the site of contact. In repeated dose inhalation studies the relevant toxic effect was irritation of the nasal mucosa. Rhinitis was observed in rats >20 ppm (71.4 mg/m³) and mice at 300 ppm (1071 mg/m³) when animals were exposed on 90 days. Additionally, in mice degenerative lesions of the olfactory epithelium occurred at doses from 100 ppm (357 mg/m³). A NOAEL for the local effects of 20 ppm (71.4 mg/m³) was derived from a study on mice. The NOAEC for systemic toxic effects was identified to be 100 ppm in mice and 300 ppm in rats. Toxic effects after dermal or oral application routes are unknown.

Genotoxicity: MAA is negative in a bacterial gene mutation test. Taking into consideration the data on the methyl ester of MAA (methyl methacrylate, MMA) - which indicate that MMA does not express a genotoxic potential in vivo - it is unlikely that MMA produces genetic damage.

Carcinogenicity: No cancer studies on MAA are available. Focal hyperplasia of the respiratory epithelium or lymphatic hyperplasia of mandibular lymph nodes in a 90-day inhalation study were not interpreted as a preneoplastic lesion but considered to represent reactive or inflammatory processes due to the irritant effect of MAA. With respect to MMA data, there is no concern on carcinogenic properties of MAA.

Reproductive toxicity: Data on reproductive toxicity of MAA in animals or humans does not exist. From studies with MMA no concern in relation to reproductive toxicity of MAA has to be assumed.

Where no "official" classification for acrylates and methacrylates exists, there has been cautious attempts to create classifications in the absence of contrary evidence. For example

Monoalkyl or monoarylesters of acrylic acids should be classified as R36/37/38 and R51/53

Monoalkyl or monoaryl esters of methacrylic acid should be classified as R36/37/38.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.

Based on the available oncogenicity data and without a better understanding of the carcinogenic mechanism the Health and Environmental Review Division (HERD), Office of Toxic Substances (OTS), of the US EPA previously concluded that all chemicals that contain the acrylate or methacrylate moiety (CH₂=CHCOO or CH₂=C(CH₃)COO) should be considered to be a carcinogenic hazard unless shown otherwise by adequate testing.

This position has now been revised and acrylates and methacrylates are no longer de facto carcinogens.

4-METHOXYPHENOL (MEHQ):

Oral (rat) LD50: 1600 mg/kg

Skin (rabbit): 6000 mg/12d-I Mild

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.

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ETHYLENE OXIDE:

Oral (rat) LD50: 72 mg/kg

Skin (human): 1%/7 sec - Irritant

Inhalation (rat) LC50: 800 ppm/4 hr

Eye (rabbit): 18 mg/6h - Moderate

Inhalation (human) TClO: 12500 ppm/10 s

Inhalation (woman) TClO: 500 ppm/2 m

■ The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

for ethylene oxide:

Ethylene oxide is very soluble in blood. Therefore, pulmonary uptake is expected to be fast and to depend only on the alveolar ventilation rate and the concentration of ethylene oxide in the inspired air. The rate of uptake of ethylene oxide in mice was 1.1 ug/kg body weight, per min, at an exposure level of 1 mg/m3. This corresponds to nearly 100% absorption of ethylene oxide from 1.1 litre of air per min and per kg body weight, which is the reported rate of alveolar ventilation in resting mice. No specific information pertaining to skin absorption is available, but accidental exposure of the skin of 3 industrial workers to 1% aqueous solution of ethylene oxide was reported to have resulted in marked nausea and profuse vomiting

Human exposure mainly occurs through inhalation in sterilisation facilities and in production plants. In sterilisation facilities, 8-h time-weighted average levels have usually been below 36 mg/m3, with short-term exposures of about 100 mg/m3, and peak levels of up to 1800 mg/m3. In production plants, the time-weighted average has usually been below 4 mg/m3. Ambient levels at a distance from point sources of emission have been estimated to be below the limit of detection. Exposure to residues of ethylene oxide or its reaction products, halohydrins and ethylene glycol, also occurs from fumigated foods, pharmaceutical products, and sterilised medical equipment. 2-Chloroethanol levels as high as several g/kg have been measured in food and levels of several hundred mg/kg in medical equipment.

When inhaled, ethylene oxide is readily absorbed, distributed throughout the body, and rapidly metabolized. Accordingly, most organs receive equivalent doses of the chemical and its metabolites. The degree of alkylation of proteins and DNA varies slightly between the different organs and blood. In man and rodents, the half-life of the compound in tissues has been estimated to be 9 - 10 min. Two metabolic pathways have been identified including hydrolysis to 1,2-ethanediol and conjugation with glutathione. Excretion is primarily via the urine. Ethylene oxide is moderately toxic for mammals (the LD50 for the rat is 280 - 365 mg/kg body weight; the 4-h LC50 is 2630 mg/m3). Both experimental animal and human data show that aqueous solutions of ethylene oxide are irritating for the skin and eyes; the irritant effects of ethylene oxide vapour or residues in medical equipment on the eyes and the respiratory tract have also been observed. These effects are often delayed. Severe skin irritation is characterized by the formation of vesicles. A concentration of 10 mg/litre produced mild irritation of the human skin; a concentration of 500 g/litre was most injurious to the human skin. Allergic contact dermatitis has been reported; systemic immunologically mediated allergy is considered rare. Respiratory tract irritation increases with inhaled vapour concentration and may result in severe life-threatening pulmonary disease. Repeated exposure (2 - 8 weeks) to ethylene oxide vapour at or above 900 mg/m3 produced sensory and motor neurological impairment and may result in a peripheral neuropathy. In animals, the latter was often accompanied by muscular atrophy. Lesions in the medulla oblongata of monkeys, following 2 years of intermittent exposure (7 h/day, 5 days/week) to 90 and 180 mg/m3 indicated neuropathy in the brain, which may be related to the neuropathies observed in man and other animal species. Cardiovascular collapse and renal failure have been attributed to residues of ethylene oxide in medical equipment. Ethylene oxide alkylates DNA and is mutagenic for plants, microorganisms, insects, and mammals. Cytogenetic studies on man have shown dose-related increased frequencies of both sister chromatid exchanges (SCEs) and chromosomal aberrations; in one study, SCEs developed following daily exposure for less than 5 min per day.

The evidence that ethylene oxide is a reproductive toxin is less conclusive. Where foetal developmental effects have occurred, the doses of ethylene oxide approached or equalled those producing maternal toxicity. To date, impaired male reproductive function in animals has been demonstrated only at concentrations of 90 mg/m3 or more in long-term intermittent exposures or at higher air concentrations for brief exposures. In pregnant women, the results of one study suggest that occupational exposure estimated to be an 8-h time-weighted average of 0.18 - 0.90 mg/m3, with peak concentrations up to 450 mg/m3, was associated with spontaneous abortions. However, limited exposure data prevents the establishment of a relationship between abortion rates and exposure levels. Ethylene oxide is carcinogenic for animals when administered by the intragastric, subcutaneous injection, and inhalation routes of exposure. In man, 2 studies have shown an association between ethylene oxide exposure and an excess risk of cancer, but both studies have limitations. Airborne concentrations of ethylene oxide in the 2 studies were reported to be time-weighted averages of 36 +/-18 mg/m3 and 10 - 50 mg/m3, with occasional brief exposures in excess of the odour threshold (900 - 1260 mg/m3).

WARNING: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS.

Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen

[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

CARCINOGEN

ETHYLENE OXIDE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
ETHYLENE OXIDE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
Ethylene oxide	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	1

REPROTOXIN

ethylene oxide	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	A
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SKIN

methacrylic acid	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
methacrylic acid	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
methacrylic acid	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
methacrylic acid	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X

methacrylic acid	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
methacrylic acid	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X

Section 12 - ECOLOGICAL INFORMATION

No data

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
2-hydroxyethyl methacrylate	LOW		LOW	HIGH
methacrylic acid	LOW		LOW	HIGH
4-methoxyphenol (MEHQ)	LOW		LOW	MED
ethylene oxide	LOW	HIGH	LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

B. Component Waste Numbers

When ethylene oxide is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U115 (waste code I,T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

‡ Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION



REGULATIONS

ND

Ingredient CAS % de minimus concentration
ethylene oxide 75-21-8 0.1

ND

Ingredient CAS RQ
ethylene oxide 75-21-8 10 lb (4.54 kg)

2-hydroxyethyl methacrylate (CAS: 868-77-9) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Program Chemical

List", "US EPA Master Testing List - Index I Chemicals Listed", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US Inventory of Effective Food Contact Substance Notifications", "US Toxic Substances Control Act (TSCA) - Inventory"
Regulations for ingredients

methacrylic acid (CAS: 79-41-4) is found on the following regulatory lists;

"Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Air Transport Association (IATA) Dangerous Goods Regulations", "International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US ACGIH Threshold Limit Values (TLV)", "US Cosmetic Ingredient Review (CIR) Cosmetic ingredients found safe, with qualifications", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Interim", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US NIOSH Recommended Exposure Limits (RELs)", "US Toxic Substances Control Act (TSCA) - Inventory"

4-methoxyphenol (MEHQ) (CAS: 150-76-5) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US ACGIH Threshold Limit Values (TLV)", "US Cosmetic Ingredient Review (CIR) Ingredients found unsafe for use in cosmetics", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US NIOSH Recommended Exposure Limits (RELs)", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements", "US TSCA Section 4/12 (b) - Sunset Date/Status", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List", "US TSCA Section 8 (d) - Health and Safety Data Reporting"

ethylene oxide (CAS: 75-21-8) is found on the following regulatory lists;

"Canada - Alberta Ambient Air Quality Objectives", "Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Saskatchewan Occupational Health and Safety Regulations - Designated Chemical Substances", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List", "Canada Environmental Protection Act (CEPA) 1999 - Schedule 1 Toxic Substances List", "Canada Environmental Protection Act (CEPA) 1999 - Schedule 3 Export Control List - Part 2 Substances Subject to Notification or Consent", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Priority Substances List (PSL1, PSL 2)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Chemical Secretariat (ChemSec) REACH SIN* List (*Substitute It Now!) 1.0", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "United Nations List of Prior Informed Consent Chemicals (English)", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California OEHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Proposition 65 - Carcinogens", "US - California Proposition 65 - Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity", "US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens", "US - California Proposition 65 - Reproductive Toxicity", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Maine Chemicals of High Concern List", "US -

Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Hazardous Materials", "US - Oregon Permissible Exposure Limits (Z-1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Class A toxic air pollutants: Known and Probable Carcinogens", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming List of Highly Hazardous Chemicals, Toxics and Reactives", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)", "US CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)", "US Clean Air Act - Hazardous Air Pollutants", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGLs) - Interim", "US EPA High Production Volume Program Chemical List", "US EPCRA Section 313 Chemical List", "US Food Additive Database", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US National Toxicology Program (NTP) 11th Report Part A Known to be Human Carcinogens", "US NFPA 45 Fire Protection for Laboratories Using Chemicals - Flammability Characteristics of Common Compressed and Liquefied Gases", "US NIOSH Recommended Exposure Limits (RELs)", "US OSHA Carcinogens Listing", "US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards", "US SARA Section 302 Extremely Hazardous Substances", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 8 (d) - Health and Safety Data Reporting", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Inhalation and/or ingestion may produce health damage*.
 - Cumulative effects may result following exposure*.
 - Possible respiratory sensitiser*.
- * (limited evidence).

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- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at: www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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Issue Date: Sep-22-2009

Print Date: Oct-20-2010