Isophorone diisocyanate

sc-235411

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

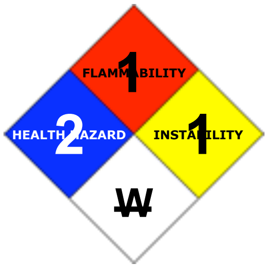
PRODUCT NAME

Isophorone diisocyanate

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

C12-H18-N2-O2, isophoronediisocyanate, "isocyanic acid, methylene(3, 5, 5-trimethyl-3, 1-cyclohexylene) ester", "isophorone diamine diisocyanate", "3-isocyanatomethyl-3, 5, 5-trimethylcyclohexylisocyanate", "5-isocyanato-1-(isocyanatomethyl)-1, 3, 3-trimethylcyclohexane"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	3		
Body Contact:	2		
Reactivity:	1		
Chronic:	2		

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

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Toxic by inhalation.
May cause SENSITISATION by inhalation and skin contact.
Irritating to eyes, respiratory system and skin.
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be damaging to the health of the individual.

EYE

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

SKIN

- This material can cause inflammation of the skin oncontact in some persons.
- The material may accentuate any pre-existing dermatitis condition.
- Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
- Human sensitisation to isophorone diisocyanate has been described in the literature. A single one-hour exposure caused eczema in three of four workers. Three workers had previously been exposed to toluene diisocyanate (TDI) and methylene biphenyl isocyanate (MDI) suggesting cross-sensitisation. When exposure ceased the skin disease disappeared. Patch testing in workers provoked allergic dermatitis.
- 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

- Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.
- The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
- The vapor/mist may be highly irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis and pulmonary edema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression and paranoia.<\div>.

CHRONIC HEALTH EFFECTS

- Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.
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.
Overexposure or repeated exposure to isophorone diisocyanate produces bronchial spasm and asthma which may not appear until several hours later. Symptoms can persist for several weeks. Most people recover completely.
Both allergy-prone and non allergy-prone people can become sensitised. Cross sensitisation to other isocyanates may occur.
With most allergens, removal of the offending agent results in asymptomatic individuals becoming asymptomatic. Isocyanate-induced asthmas may continue for months or even years after exposure ceases. This response may be due to a nonimmunologic condition known as reactive airway dysfunction syndrome (RADS) which occurs following exposure to high levels of irritating compounds eg. smoke and air pollutants.
Persons with a history of asthma or other respiratory problems or are known to be sensitised, should not be engaged in any work involving the handling of isocyanates. [CCTRADE-Bayer, APMF].
Isocyanate vapors are irritating to the airways and can cause their inflammation, with wheezing, gasping, severe distress, even loss of consciousness and fluid in the lungs. Nervous system symptoms that may occur include headache, sleep disturbance, euphoria, inco-ordination, anxiety, depression and paranoia.
<\p>.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
isophorone diisocyanate	4098-71-9	>98

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: · Immediately hold eyelids apart and flush the eye continuously with 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

■ For sub-chronic and chronic exposures to isocyanates:
· This material may be a potent pulmonary sensitizer which causes bronchospasm even in patients without prior airway hyperreactivity.
· Clinical symptoms of exposure involve mucosal irritation of respiratory and gastrointestinal tracts.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0.007 @ 50 C
Upper Explosive Limit (%):	Not available
Specific Gravity (water=1):	1.062
Lower Explosive Limit (%):	Not available

EXTINGUISHING MEDIA

· Small quantities of water in contact with hot liquid may react violently with generation of a large volume of rapidly expanding hot sticky semi-solid foam.
· Presents additional hazard when fire fighting in a confined space.
· Cooling with flooding quantities of water reduces this risk.
· Water spray or fog may cause frothing and should be used in large quantities.
· Foam.
· Dry chemical powder.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.
When any large container (including road and rail tankers) is involved in a fire,
consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Combustible.
· Moderate fire hazard when exposed to heat or flame.
Combustion products include: carbon dioxide (CO2), isocyanates, and minor amounts of, hydrogen cyanide, nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.
When heated at high temperatures many isocyanates decompose rapidly generating a vapour which pressurises containers, possibly to the point of rupture. Release of toxic and/or flammable isocyanate vapours may then occur.

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:
1.BUTYL 2.PVA 3.VITON
Respirator:
Type A Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Remove all ignition sources.
· Clean up all spills immediately.
MAJOR SPILLS
· Liquid Isocyanates and high isocyanate vapour concentrations will penetrate seals on self contained breathing apparatus - SCBA should be used inside encapsulating suit where this exposure may occur.
· Treat isocyanate spills with sufficient amounts of isocyanate decontaminant preparation.
· Typically, such a preparation may consist of: sawdust: 20 parts by weight Kieselguhr 40 parts by weight plus a mixture of {ammonia (s.g. 0.880) 8% v/v non-ionic surfactant 2% v/v water 90% v/v}.
· Let stand for 24 hours.
· Avoid contamination with water, alkalies and detergent solutions.
· Material reacts with water and generates gas, pressurises containers with even drum rupture resulting.
· DO NOT reseal container if contamination is suspected.

- Open all containers with care.
- 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

- 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.

Decant in a well-ventilated area or under an exhaust hood. Avoid contact with moisture. Never add water to this product. DO NOT return unused product to containers.

RECOMMENDED STORAGE METHODS

- Lined metal can, Lined metal pail/drum
- Plastic pail.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

■ for commercial quantities of isocyanates:

- Isocyanates should be stored in adequately bunded areas. Nothing else should be kept within the same bunding. Pre-polymers need not be segregated. Drums of isocyanates should be stored under cover, out of direct sunlight, protected from rain, protected from physical damage and well away from moisture, acids and alkalis.
- Where isocyanates are stored at elevated temperatures to prevent solidifying, adequate controls should be installed to prevent the high temperatures and precautions against fire should be taken.
- Where stored in tanks, the more reactive isocyanates should be blanketed with a non-reactive gas such as nitrogen and equipped with absorptive type breather valve (to prevent vapour emissions)..
- Transfer systems for isocyanates in bulk storage should be fully enclosed and use pump or vacuum systems. Warning signs, in appropriate languages, should be posted where necessary.
- Areas in which polyurethane foam products are stored should be supplied with good general ventilation. Residual amounts of unreacted isocyanate may be present in the finished foam, resulting in hazardous atmospheric concentrations.
- Store in original containers.
- Keep containers securely sealed.

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 - Alberta Occupational Exposure Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005	0.05					
Canada - British Columbia Occupational Exposure Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005				0.01		S
US NIOSH Recommended Exposure Limits (RELs)	isophorone diisocyanate (Isophorone diisocyanate)	0.005	0.045	0.02	0.180			[skin]
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	isophorone diisocyanate (Isophorone diisocyanate)	0.005	0.045					
US ACGIH Threshold Limit Values (TLV)	isophorone diisocyanate (Isophorone diisocyanate)	0.005						TLV Basis: respiratory sensitization
US - Vermont Permissible Exposure Limits	isophorone diisocyanate (Isophorone	0.005		0.02				

Table Z-1-A Final Rule Limits for Air Contaminants	diisocyanate)							
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.02				
US - Minnesota Permissible Exposure Limits (PELs)	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.02				
US - California Permissible Exposure Limits for Chemical Contaminants	isophorone diisocyanate (Isophorone diisocyanate; IPDI)	0.005	0.045	0.02				
US - Alaska Limits for Air Contaminants	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.02				
US - Michigan Exposure Limits for Air Contaminants	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.02				
US - Hawaii Air Contaminant Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005	0.045	0.02				
US - Washington Permissible exposure limits of air contaminants	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.02				
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005		0.015				
Canada - Nova Scotia Occupational Exposure Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005						TLV Basis: respiratory sensitization
Canada - Prince Edward Island Occupational Exposure Limits	isophorone diisocyanate (Isophorone diisocyanate)	0.005						TLV Basis: respiratory sensitization
US - Oregon Permissible Exposure Limits (Z-2)	isophorone diisocyanate (Diisocyanates: Isophorone diisocyanate (IPDI))	0.005	0.045			0.02	0.180	
Canada - Northwest Territories Occupational Exposure Limits (English)	isophorone diisocyanate (Isophorone diisocyanate - Skin)	0.01	0.09	0.03	0.27			

ENDOELTABLE

PERSONAL PROTECTION

RESPIRATOR

Type A 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.
· Isocyanate resistant materials include Teflon, Viton, nitrile rubber and some PVA gloves.
· Protective gloves and overalls should be worn as specified in the appropriate national standard.
· Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated.
· NOTE: Natural rubber, neoprene, PVC can be affected by isocyanates.

OTHER

· Overalls.
· Eyewash unit.

ENGINEERING CONTROLS

■ Spraying of material or material in admixture with other components must be carried out in conditions conforming to local state regulations. Local exhaust ventilation with full face air supplied breathing apparatus (hood or helmet type) is normally required.
<\p>.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.
Toxic or noxious vapours/gas.

State	Liquid	Molecular Weight	222.29
Melting Range (°F)	-76	Viscosity	Not Available
Boiling Range (°F)	316.4- 318.2 (15 mm)	Solubility in water (g/L)	Reacts
Flash Point (°F)	325.4	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	806	Vapor Pressure (mmHg)	0.007 @ 50 C
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.062
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Negligible	Evaporation Rate	Not available

APPEARANCE

Colourless to slightly yellow liquid; reacts with water. Miscible with esters, ketones, ethers, and aromatic and aliphatic hydrocarbons.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.

Polymerisation may occur slowly at room temperature. Contact with concentrated alkaline compounds such as NaOH or tert-amines may cause polymerisation.

STORAGE INCOMPATIBILITY

· Reactions of isocyanates with amines, aldehydes, alcohols, alkali metals, ketones, mercaptans, strong oxidizers, hydrides, phenols, and peroxides can cause vigorous release of heat.
· Acids and bases initiate polymerization reactions with isocyanates.
· Avoid reaction with water, alcohols and detergent solutions.
· Isocyanates and thioisocyanates are incompatible with many classes of compounds, reacting exothermically to release toxic gases. Reactions with amines, strong bases, aldehydes, alcohols, alkali metals, ketones, mercaptans, strong oxidisers, hydrides, phenols, and peroxides can cause vigorous releases of heat. Acids and bases initiate polymerisation reactions in these materials.
· Isocyanates easily form adducts with carbodiimides, isothiocyanates, ketenes, or with substrates containing activated CC or CN bonds.
· Some isocyanates react with water to form amines and liberate carbon dioxide. This reaction may also generate large volumes of foam and heat. Foaming in confined spaces may produce pressure in confined spaces or containers. Gas generation may pressurise drums to the point of rupture.
· Do NOT reseal container if contamination is expected
· Open all containers with care
· Base-catalysed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence,
· Isocyanates will attack and embrittle some plastics and rubbers.
· A range of exothermic decomposition energies for isocyanates is given as 20-30 kJ/mol.
· The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment.
· For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.
BRETHERICK: Handbook of Reactive Chemical Hazards, 4th Edition.
Segregate from alcohol, water.

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

Section 11 - TOXICOLOGICAL INFORMATION

ISOPHORONE DIISOCYANATE

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Inhalation (rat) LC50: 123 mg/m³/4h	Nil Reported
Oral (rat) LD50: 5490 mg/kg* *[Bayer]	

■ 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.
<\p>.
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.
Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms.
<\p>.
Attention should be paid to atopic diathesis, characterized by increased susceptibility to nasal inflammation, asthma and eczema.
Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

for diisocyanates:

In general, there appears to be little or no difference between aromatic and aliphatic diisocyanates as toxicants. In addition, there are insufficient data available to make any major distinctions between polymeric (<1000 MW) and monomeric diisocyanates. Based on repeated dose studies in animals by the inhalation route, both aromatic and aliphatic diisocyanates appear to be of high concern for pulmonary toxicity at low exposure levels. Based upon a very limited data set, it appears that diisocyanate prepolymers exhibit the same respiratory tract effects as the monomers in repeated dose studies. There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route. Most members of the diisocyanate category have not been tested for carcinogenic potential. Though the aromatic diisocyanates tested positive and the one aliphatic diisocyanate tested negative in one species, it is premature to make any generalizations about the carcinogenic potential of aromatic versus aliphatic diisocyanates. In the absence of more human data, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitisers. Diisocyanates are moderate to strong dermal sensitisers in animal studies. Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic

versus aliphatic diisocyanates.
For monomers, effects on the respiratory tract (lungs and nasal cavities) were observed in animal studies at exposure concentrations of less than 0.005 mg/L. The experimental animal data available on prepolymeric diisocyanates show similar adverse effects at levels that range from 0.002 mg/L to 0.026 mg/L.
There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route
Oncogenicity: Most members of the diisocyanate category have not been tested for carcinogenic potential. Commercially available Poly-MDI was tested in a 2-year inhalation study in rats. The tested material contained 47% aromatic 4,4'-methylenediphenyl diisocyanate (MDI) and 53% higher molecular weight oligomers. Interim sacrifices at one year showed that males and females in the highest dose group (6 mg/m3) had treatment related histological changes in the nasal cavity, lungs and mediastinal lymph nodes. The incidence and severity of degeneration and basal cell hyperplasia of the olfactory epithelium and Bowman's gland hyperplasia were increased in males at the mid and high doses and in females at the high dose following the two year exposure period. Pulmonary adenomas were found in 6 males and 2 females, and pulmonary adenocarcinoma in one male in the high dose group. However, aliphatic hexamethylene diisocyanate (HDI) was found not to be carcinogenic in a two year repeated dose study in rats by the inhalation route. HDI has not been tested in mice by the inhalation route.
Though the oral route is not an expected route of exposure to humans, it should be noted that in two year repeated dose studies by the oral route, aromatic toluene diisocyanate (TDI) and 3,3'-dimethoxy-benzidine-4,4'-diisocyanate (dianisidine diisocyanate, DADI) were found to be carcinogenic in rodents. TDI induced a statistically significant increase in the incidence of liver tumors in rats and mice as well as dose-related hemangiosarcomas of the circulatory system and has been classified by the Agency as a B2 carcinogen. DADI was found to be carcinogenic in rats, but not in mice, with a statistically increase in the incidence of pancreatic tumors observed.
Respiratory and Dermal Sensitization: Based on the available toxicity data in animals and epidemiologic studies of humans, aromatic diisocyanates such as TDI and MDI are strong respiratory sensitisers. Aliphatic diisocyanates are generally not active in animal models for respiratory sensitization. However, HDI and possibly isophorone diisocyanate (IPDI), are reported to be associated with respiratory sensitization in humans. Symptoms resulting from occupational exposure to HDI include shortness of breath, increased bronchoconstriction reaction to histamine challenges, asthmatic reactions, wheezing and coughing. Two case reports of human exposure to IPDI by inhalation suggest IPDI is a respiratory sensitiser in humans. In view of the information from case reports in humans, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitisers. Studies in both human and mice using TDI, HDI, MDI and dicyclohexylmethane-4,4'-diisocyanate (HMDI) suggest cross-reactivity with the other diisocyanates, irrespective of whether the challenge compound was an aliphatic or aromatic diisocyanate. Diisocyanates are moderate to strong dermal sensitisers in animal studies. There seems to be little or no difference in the level of reactivity between aromatic and aliphatic diisocyanates.
Dermal Irritation: Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic versus aliphatic diisocyanates. The level of irritation ranged from slightly to severely irritating to the skin. One chemical, hydrogenated MDI (1,1-methylenebis-4-isocyanatocyclohexane), was found to be corrosive to the skin in guinea pigs.
Isocyanate vapors are irritating to the airways and can cause their inflammation, with wheezing, gasping, severe distress, even loss of consciousness and fluid in the lungs. Nervous system symptoms that may occur include headache, sleep disturbance, euphoria, inco-ordination, anxiety, depression and paranoia.
<\p>.

SKIN

isophorone diisocyanate	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
isophorone diisocyanate	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
isophorone diisocyanate	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
isophorone diisocyanate	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X
isophorone diisocyanate	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
isophorone diisocyanate	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X

Section 12 - ECOLOGICAL INFORMATION

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
This material and its container must be disposed of as hazardous waste.
Avoid release to the environment.
Refer to special instructions/ safety data sheets.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
isophorone diisocyanate	HIGH		LOW	LOW

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _________ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Isophoron 881 400 1 NI 1 NR 4 NI 0 0 4 3 3 SA S 3 e diisocyan ate / CAS:4098- 71- 9 / NQ9370000

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

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.
· DO NOT recycle spilled material.
· Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: None Hazard class or Division: 6.1
Identification Numbers: UN2290 PG: III
Label Codes: 6.1 Special provisions: IB3, T4,
TP2
Packaging: Exceptions: 153 Packaging: Non- bulk: 203
Packaging: Exceptions: 153 Quantity limitations: 60 L
Passenger aircraft/rail:
Quantity Limitations: Cargo 220 L Vessel stowage: Location: B
aircraft only:
Vessel stowage: Other: 40
Hazardous materials descriptions and proper shipping names:
Isophorone diisocyanate

Air Transport IATA:

ICAO/IATA Class: 6.1 ICAO/IATA Subrisk: None
UN/ID Number: 2290 Packing Group: III
Special provisions: None
Cargo Only
Packing Instructions: 618 Maximum Qty/Pack: 220 L
Passenger and Cargo Passenger and Cargo
Packing Instructions: 611 Maximum Qty/Pack: 60 L
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: Y611 Maximum Qty/Pack: 2 L
Shipping Name: ISOPHORONE DIISOCYANATE

Maritime Transport IMDG:

IMDG Class: 6.1 IMDG Subrisk: None
UN Number: 2290 Packing Group: III
EMS Number: F-A , S-A Special provisions: None
Limited Quantities: 5 L Marine Pollutant: Yes
Shipping Name: ISOPHORONE DIISOCYANATE

Section 15 - REGULATORY INFORMATION

REGULATIONS

isophorone diisocyanate (CAS: 4098-71-9) is found on the following regulatory lists;

"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 - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada National Pollutant Release Inventory (NPRI)","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 Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals","OSPAR Substances removed from the List of Substances of Possible Concern","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 - Oregon Permissible Exposure Limits (Z-1)","US - Oregon Permissible Exposure Limits (Z-2)","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 DOE Temporary Emergency Exposure Limits (TEELs)","US EPA High Production Volume Program Chemical List","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US NIOSH Recommended Exposure Limits (RELs)","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List","US TSCA Section 8 (d) - Health and Safety Data Reporting"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Skin contact and/or ingestion may produce health damage*.
■ Cumulative effects may result following exposure*.
* (limited evidence).

■ 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.

Issue Date: Oct-18-2009

Print Date:Oct-13-2010