Material Safety Data Sheet

THERMAL GREEN RESIN

Pinnacle West Enterprises Inc.
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Section 1 – PRODUCT & MANUFACTURER IDENTIFICATION

MANUFACTURER
GENYK Inc.
1701,3e Avenue
Grand-Mère, Qc
G9T2W6
Tel : 819-729-0395
Fax : 819-729-0383

VALIDATION DATE
January 2018

PRODUCT
Commercial name: THERMAL GREEN Resin
Chemical name : Blend of polyols
Material uses : Component of a rigid polyurethane foam system

WHMIS CLASSIFICATION
Class D, Division 2B

Section 2 - COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENTS	CAS #	%
1,1,1,3,3-pentafluoropropane	460-73-1	5 - 20
Blend of polyols	N/A	40 – 60
Amine Polyol	940912-28-7	10 - 40
Blend of tertiary amines	N/A	2.0 - 6.5
Tris-iso-chloropropyl phosphate	13674-84-5	3 – 18
Butane, 1,1,1,3,3 – Pentafluoro	406-58-6	4 – 12
Propane,1,1,1,3,3,3,3	431-89-0	1 - 6

Section 3 – PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Liquid
Color : Dark
Odor : slightly amine odor
Specific gravity : 1.16 – 1.22
Vapor pressure : < 22 psi at 130ºF (<152 kPa at 54ºC)
Vapor density : 4.6 (1,1,1,3,3- pentafluoropropane)
Boiling/condensation point : N/A
Solubility in water : Moderate.
Flash point :> 200ºF (93ºC)

Section 4 – FIRE-FIGHTING MEASURES

Extinguishing media : Carbon dioxide, dry chemical or appropriate foam, water spray for large fires.

Fire-fighting procedures : Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes. Use cold water spray to cool fire-exposed containers to minimize risk of rupture.

Section 5 - STABILITY AND REACTIVITY

Hazardous polymerisation : Hazardous polymerisation does not occur.

Stability : Stable.

Materials to avoid : Oxidizing agents, Isocyanates.

Hazardous decomposition products : By fire: Carbon dioxide, Carbon monoxide; other aliphatic fragments which have not been determined.

Section 6 – POTENTIAL HEALTH EFFECTS

Route(s) of entry : Skin contact, eye contact, inhalation and ingestion.

Eye : Can cause eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes.

Skin : Can cause moderate skin irritation. Symptoms may include redness and other skin damage. Additional symptoms of skin contact may include: allergic skin reaction (delayed skin rash which may be followed by blistering, scaling and other skin effects).

Inhalation : Breathing of vapor or mist is possible. Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful.

Ingestion : Symptoms may include severe stomach and intestinal irritation (nausea, vomiting and diarrhea), abdominal pain, and vomiting. Swallowing this material may cause digestive tract burns.

Section 7 – FIRST AID MEASURES

First aid for eyes : Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

First aid for skin

First aid for Inhalation	: Remove contaminated clothing. Flush exposed area with large amounts of water. If skin is damaged, seek immediate medical attention. Launder clothing before reuse.
First aid for ingestion	: If symptoms develop, immediately move individual away from exposure and into fresh air. Get medical attention if irritation develops. : If conscious, give 250 ml of milk or water to drink, and induce vomiting. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Obtain immediate medical attention.

Section 8 – ACCIDENTAL RELEASE MEASURES AND DISPOSAL CONSIDERATIONS

Action to take for spills/leaks	: Absorb with sawdust or other absorbent and shovel into suitable containers. Use appropriate personal protective equipment during clean up. Evacuate and keep unnecessary people out of spill area.
Clean-up	: Wash down surfaces with soap and warm water.
Waste disposal	: Waste must be disposed of in accordance with federal, state, and local environmental control regulations. Incineration is the preferred method. Empty containers must be handled with care due to product residue. Empty containers must be handled with care due to product residue.

Section 9 – HANDLING PRECAUTIONS

Eye protection	: Use safety glasses or chemical goggles.
Skin protection	: Use protective clothing impervious to chemicals. Selection of specific items such as gloves, boots or apron will depend on operation.
Ventilation	: Local exhaust should be used to maintain a fresh supply of air.

Section 10 – HANDLING AND STORAGE

Handling and storage procedures	: Store in tightly closed containers in a cool, dry place. Avoid breathing vapours and contact with eyes or skin.
Storage temperature	: 15°C to 30°C (59°F - 86°F).

Section 11 – TRANSPORTATION INFORMATION

Technical shipping name	: Polyol blend, THERMAL GREEN Resin
T.M.D. Classification	: Not regulated
OMI Classification	: Not regulated
IATA/OACI Classification	: Not regulated
Emergency phone number	: (613) 996-6666 CANUTEC.

Section 12 – REGULATORY INFORMATION

The substance(s) in this product is/are on the Canadian Domestic Substances List.

Section 11 – OTHER INFORMATION

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release. It is not to be considered a warranty or quality specification.

Prepared by	: GENYK Inc.
Date	: January 2018

Material Safety Data Sheet

1. Identification

Product Name : **ISOCYANATE A-2732**

Genyk inc.
1701, 3rd Avenue
Shawinigan, Qc
G9T 2W6
Tel : 819-729-0395
Fax : 819-729-0383
Email : info@genyk.com

Product type : Liquid.
Product Use : Component of a Polyurethane System
Validation Date : May 2016

In case of emergency, call :	**Chemtrec : 1-800-424-9300 or 703-527-3887**

2. Hazards identification

OSHA/HCS status

This Material is classified as hazardous under OSHA Hazard Communication Standard (29 CFR 1910.1200)
ACUTE TOXICITY : INHALATION – Category 4
SKIN CORROSION / IRRITATION – Category 2

Classification of the substance or mixture

SERIOUS EYE DAMAGE / EYE IRRITATION – Category 1
SKIN SENSITIZATION – Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) {Respiratory tract irritation} – Category 3

GSH label elements
Hazard pictograms

Signal word Danger

Hazard statements

Harmful if inhaled.
Causes skin and eye irritation.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
May cause an allergic skin reaction.
May cause respiratory irritation.

2. Hazards identification

Precautionary statements	Wear protective gloves : >8 hours (breakthrough time) : butyl rubber, Ethyl vinyl, Alcohol Laminated (EVAL). Wear eye or face protection. In case of inadequate ventilation wear respiratory protection. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. IF INHALED : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. If experiencing respiratory symptoms : Call a POISON CENTER or physician. IF ON SKIN : Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation or rash occurs : Get medical attention. IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritaiton persists : Get medical attention. Store locked up. Dispose of contents and container in accordance with all local, regional, national and international regulations.
Other hazards which do not result in classification	Not available.

3. Composition / information on ingredients

Substance / mixture Mixture

Ingredient name	**%**	**CAS number**
Isocyanic acid, polymethylenopolyphenylene ester	60-100	9016-87-9
Diphenylmethane 4,4'-diisocyanate	30-60	101-68-8

Any concentration shown as a range is to protect confidentiality or is due to batch variation.
Occupational exposure limits, if available, are listed in Section 8.

4. First aid measures

Description of necessary first aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.
Inhalation	Move exposed person to fresh air. Get medical attention immediately. Treatment is symptomatic for primary irritation or bronchospasm. If breathing is laboured, oxygen should be administered by qualified personnel.

4. First aid measures

Skin contact	After contact with skin, wash immediately with plenty of warm soapy water : Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. An MDI study has demonstrated that a polyglycol-based skin cleanser (such as D-TamTM, PEG-400) or corn oil may be more effective than soap and water. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Provided the patient is conscious, wash out mouth with water. Get medical attention if symptoms appear.

Most important symptoms / effects, acute and delayed – Potential acute health effects

Eye contact	Causes eye irritation.
Inhalation	Harmful if inhaled. May cause respiratory irritation. This product is a respiratory irritant and potential respiratory sensitiser : repeated inhalation of vapour or aerosol at levels above the occupational exposure limit could cause respiratory sensitisation. Symptoms may include irritation to the eyes, nose, throat and lungs, possibly combined with dryness of the troat, tightness of chest and difficulty in breathing. The onset of the respiratory symptoms may be delayed for several hiours after exposure. A hyper-reactive response to even minimal concentrations of MDI may develop in sensitised persons. LC50 (rat) : ca. 490 mg/m^3 (4 hours) : using experimentally produced respirable aerosol having aerodynamic diameter <5 microns.
Skin contact	Causes skin irritation. May cause sensitization by skin contact. Animal studies have shown that respiratory sensitisation can be induced by skin contact with known respiratory sensitisers including diisocyanates. These results emphasize the need for protective clothing including gloves ot be worn at all times when handling these chemical or in maintenance work.
Ingestion	Low oral toxicity, but ingestion may cause irritation of the gastrointestinal tract.

Over-exposure signs / symptoms

Eye contact	Adverse symptoms may include the following : Pain or irritation Watering Redness

4. First aid measures

Inhalation	Adverse symptoms may include the following : Respiratory tract irritation Coughing Wheezing and breathing difficulties Asthma
Skin contact	Adverse symptoms may include the following : Irritation Redness
Ingestion	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	Symptomatic treatment and supportive therapy as indicated. Following severe exposure the patient should be kept under medical review for at least 48 hours.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing appartus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

5. Fire-fighting measures

Flash point	Closed cup : >150°C (>302°F) Open cup : 230°C (446°F)

Extinguishing media

Suitable extinguishing media	Foam, CO2 or dry powder.
Unsuitable extinguishing media	Water may used if no other available and then in copious quantities. Reaction between water and hot isocyanate ma be vigorous. Prevent washings from entering water courses, keep fire exposed containers cool by spraying with water.
Specific hazards arising from the chemical	In a fire or if heated, a pressure increase will occur and the container may burst.
Hazardous thermal decomposition products	Combustion products may include : carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and HCN.
Special protective actions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

5. Fire-fighting measures

Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing appartus (SCBA) with a full face-piece operated in positive pressure mode. PVC boots, gloves, safety helmet and protective cloghing should be worn.
Remark	Due to reaction with water producing CO2-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Containers may burst if overheated.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
For emergency responders	If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in « For non-emergency personnel ».
Environmental precautions	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air)
Methods and materials for containment and cleaning up	If the product is in its solid form : Spilled MDI flakes should be picked up carefully. The area should be vacuum cleaned to remove remaining dust particles completely. If the product is in its liquid form : Absorb spillages onto sand, earth or any suitable adsorbent material. Leave to react for at least 30 minutes. Shovel into open-top drums for further decontamination. Wash the spillage area with water. Test atmosphere for MDI vapour. Neutralise small spillages with decontaminant. Remove and dispose of residues. The compositions of liquid decontaminants are given in Section 16. Note : see Section 1 for emergency contact information and Section 13 for waste disposal.

7. Handling and storage

Precautions for safe handling

Protective measures	Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure – obtain special instruction before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when no in use. Empty containers retain product residue and can be hazardous.
Advice on general occupational hygiene	Eating, drinking and smoking should be prohibited in areas where this material is handled, sotred and processes. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
Conditions for safe storage, including any incompatibilities	Store in accordance with local regulations. Keep container tightly closed in a cool, sell-ventilated place. Keep away from moisture. Due to reaction with water producing CO2-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Do not reseal contaminated containers. Uncontaminated containers, free of moisture, may be resealed only after placing under a nitrogen blanket. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. Unsuitable containers : Do not store in containers made of copper, copper alloys or galvanized surfaces.

8. Exposure controls / personal protection

Control parameters – Occupational exposure limits

Ingredient name	Exposure limits
4.4’ - Methylenediphenyl diisocyanate	**ACGIH TLV (United States, 6/2013)** TWA : 0.005 ppm 8 hours. **OSHA PEL (United states, 2/2013)** CEIL : 0.02 ppm CEIL : 0.2 MG/M^3

8. Exposure controls / personal protection

Appropriate engineering controls	Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or satutory limits. Diisocyanates can only be smelled if the occupational exposure limit has been exceeded considerably. Medical supervision of all employees who handle or come in contact with respiratory sensitisers is recommended. Personnel with a history of asthma-type conditions, bronchitis or skin sensitisation conditions should not work with MDI based products. The Occupational Exposure Limits listed do not apply to previously sensitised individuals. Sensitised individuals should be removed from any further esposure.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fure scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Eye / face protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Hand protection	Use chemical resistant gloves classified under Standard EN374 : protective gloves against chemicals and microorganisms. Examples of glove materials that might provide suitable protection include : Butyl rubber, Chlorinated polyethylene, Polyethylene, Ethyl vinyl alcohol copolymers laminated (''EVAL''), Polychloroprene (Neoprene*), Nitrile/butadiene rubber (''nitrile'' or ''NBR''), Polyvinyl chloride (''PVC'' or ''vinyl''), Fluoroelastomer (Viton*). When prolonged or frequently repeated contact may occur, a glove with protection class of 5 or higher (breakthrough time greater then 240 minutes according to EN374) is recommended. Contaminated gloves should be decontaminated and disposed of.

8. Exposure controls / personal protection

	Notice : The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all requisite workplace factors such as,but not limited to : other chemicals that may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), as well as instructions/ specifications provided by the glove supplier. Protective gloves be worn when handling freshly made polyurethane products to avoid contact with trace residual materials which may be hazardous in contact with skin.
Body protection	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended : Overall (preferably heavy cotton) or Tyvek-Pro Tech 'C', Tyvek-Pro 'F' disposable coverall.
Other skin protection	Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory Protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Thermal hazards	Not available.

9. Physical and chemical properties

Appearance

Physical state	Liquid.
Color	Not available.
Odor	Not available
Odor threshold	Not available
pH	Not available
Melting point /Freezing point	Not available
Boiling / Condensation point	>300°C decomposes
Flash point	Closed cup : >150°C (>302°F) Open cup : 230°C (446°F)
Evaporation rate	Not available.
Flammability (solid, gas)	Not available

9. Physical and chemical properties

Lower and upper explosive (flammable) limits	Not available
Vapor pressure	Not available
Vapor density	Not available
Relative density	Not available
Solubility in water	Not available
Partition coefficient : n-octanol/water	Not available
Auto-ignition temperature	>600°C
Decomposition temperature	Not available
Viscosity	Not available

10. Stability and reactivity

Reactivity	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	Stable at room temperature.
Possibility of hazardous reactions	Reaction with water (moisture) produces CO2-gas. Exothermic reaction with materials containing active hydrogen groups. The reaction becomes progressively more vigorous and can be violent at higher temperatures if the miscibility of the reaction partners is good or is supported by stirring or by the presence of solvents. MDI is insoluble with, and heavier than water and sinks to the bottom but reacts slowly at the interface. A solid water-insoluble laver of polyurea is formed at the interface by liberating carbon dioxide gas.
Conditions to avoid	Avoid high temperatures.
Incompatible materials	Water, alcohols, amines, bases, and acids.
Hazardous decomposition products	Combustion products may include : Carbon oxides (CO, CO_2) nitrogen oxides (NO, NO_2) hydrocarbons and HCN

11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Test	Endpoint	Species	Result
Isocyanic acid, polymethylenepolyphenylene ester	OECD 403 Acute Inhalation Toxicity	LC50 Inhalation Dusts and mists	Rat – Male, Female	0.49 mg/l
	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rabbit – Male, Female	>9400 mg/kg
	OECD 401 Acute Oral toxicity	LD50 Oral	Rat – Male	> 10000 mg/kg
	OECD 403 Acute Inhalation Toxicity	LC50 Inhalation Dusts and mists	Rat – Male, Female	0.49 mg/l
	OECD 402 Acute Dermal Toxicity	LD50 Dermal	Rabbig – Male, Female	>9400 mg/kg
	OECD 401 Acute Oral Toxicity	LD50 Oral	Rat – Male	> 10000 mg/kg
Conclusion / Summary	4,4' – Methylenediphenyl diisocyanate	Irritating to respiratory system.		

Irritation / Corrosion

Product/ingredient name	**Test**	**Species**	**Result**
Isocyanic acid, polymethylenepolyphenylene ester	OECD 404 Acute Dermal Irritation / Corrosion	Rabbit	Skin – Mild irritant
	OECD 405 Acute Eye Irritation / Corrosion	Rabbit	Eyes – Non-irritant.
Diphenylmethane 4,4'-diisocyanate	OECD 404 Acute Dermal Irritation / Corrosion	Rabbit	Skin - Irritant
	OECD 405 Acute Eye Irritation / Corrosion	Rabbit	Eyes – Non-irritant.

Conclusion / Summary

Skin	Isocyanic acid, polymethylenepolyphenylene ester	– Irritating to skin
	Diphenylmethane 4,4'-diisocyanate	– Irritating to skin
Eyes	Isocyanic acid, polymethylenepolyphenylene ester	Based on the human occupational exposure data, this substance is considered as irritating to eyes.

11. Toxicological information

	Diphenylmethane 4,4'-diisocyanate	Based on the human occupational exposure data, this substance is considered as irritating to eyes.
Respiratory	Isocyanic acid, polymethylenepolyphenylene ester	No additional information.
	Diphenylmethane 4,4'-diisocyanate	No additional information.

Sensitization

Product/ingredient name	Test	Route of exposure	Species	Result
Isocyanic acid, polymethylenepolyphenylene ester	OECD 406 Skin Sensitization	Skin	Guinea pig	Not sensitizing
	No official guidelines	Respiratory	Rat	Sensitizing
	OEC 429 Skin sensitization : Local Lymph Node Assay	Skin	Guinea pig	Sensitizing
Diphenylmethane 4,4'-diisocyanate	OECD 406 Skin Sensitization	Skin	Mouse	Sensitizing
	No official guidelines	Skin	Guinea pig	Not sensitizing
		Respiratory	Guinea pig	Sensitizing

Mutagenicity

Product/ingredient name	Test	Result
Isocyanic acid, polymethylenepolyphenylene ester	Experiment : In vitro Subject : Bacteria Metabolic activation : +/-	Negative
	Experiment : In Vivo Subject : Mammalian-Animal	Negative
	Experiment : In vivo Subject : Mammalian-Human	Equivocal
Diphenylmethane 4,4'-diisocyanate	Experiment : In vitro Subject : Bacteria Metabolic activation : +/-	Negative
	Experiment : In vivo Subject : Mammalian-Animal	Negative

11. Toxicological information

Conclusion/Summary :

Isocyanic acid, polymethylenepolyphenylene ester	No mutagenic effect.
Diphenylmethane 4,4'-diisocyanate	No mutagenic effect.

Carcinogenicity

Product/ ingredient name	Test	Species	Dose	Exposure	Result/ Result type
Isocyanic acid, polymethylene polyphenylene ester	OECD 453 Combined Chronic Toxicity / Carcinogenicity Studies	Rat – Male, Female	1 mg/m^3	2 years; 5 days per week	Negative- Inhalation - NOAEL
4,4'-Methylenediphenyl diisocyanate	OECD 453 Combined Chronic Toxicity / Carcinogenicity Studies	Rat – Male, Female	1 mg/m^3	2 years; 5 days per week	Positive- Inhalation - NOAEL

Carcinogenic class

Product/ingredient name	IARC	OSHA
Isocyanic acid, polymethylenepolyphenylene ester	3	-
4,4'-Methylenediphenyl diisocyanate	3	-

Reproductive toxicity

Product/ ingredient name	Test	Species	Maternal toxicity	Fertility	Developmental effects
Isocyanic acid, polymethylene polyphenylene ester	OECD 414 Prenatal Developmental Toxicity Study	Rat – Male, Female	Negative	Negative	Negative

11. Toxicological information

Conclusion/Summary :

Isocyanic acid, polymethylenepolyphenylene ester	No known significant effects or critical hazards.
4,4'-Methylenediphenyl diisocyanate	No known significant effects or critical hazards.

Teratogenicity

Product/ingredient name	Test	Species	Result/Result type
Isocyanic acid, polymethylenepolyphenylene ester	OECD 414 Prenatal Developmental Toxicity Study	Rat – Male, Female	Negative – Inhalation
	OECD 414 Prenatal Developmentsl toxicity Study	Rat – Male, Female	Negative, Inhalation
Diphenylmethane 4,4'-diisocyanate	OECD 414 Prenatal Developmental Toxicity Study	Rat – Female	Negative – Inhalation

Conclusion/Summary :

Isocyanic acid, polymethylenepolyphenylene ester	No known significant effects or critical hazards.
4,4'-Methylenediphenyl diisocyanate	No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target Organs
Isocyanic acid, polymethylenepolyphenylene ester	Category 3	Not applicable	Respiratory tract irritation
Diphenylmethane 4,4'-diisocyanate	Category 3	Not applicable	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available

Aspiration hazard

Not available

11. Toxicological information

Information on the likely routes of exposure

Not available

Potential acute health effects

Eye contact	Causes eye irritation.
Inhalation	Harmful if inhaled. May cause respiratory irritation. This product is a respiratory irritant and potential respiratory sensitiser : repeated inhalation of vapour or aerosol at levels above the occupational exposure limit could cause respiratory sensitisation. Symptoms may include irritation to the eyes, nose, throat and lungs, possibly combined with dryness of the throat, tightness of chest and difficulty in breathing. The onset of the respiratory symptoms may be delayed for several hours after exposure. A hyper-reactive response to even minimal concentrations of MDI may develop in sensitised persons. LC50 (rat) : ca. 490mg/m^3 (4 hours) : using experimentally produced respirabe aerosol having aerodynamic diameter <5micron.
Skin contact	Causes skin irritation. May cause sensitization by skin contact. Animal studies have shown that respiratory sensitisation can be induced by skin contact with known respiratory sensitisers including diisocyanates. These results emphasize the need for protective clothing including gloves to be worn at all times when handling these chemicals or in maintenance work.
Ingestion	Low oral toxicity, but ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact	Adverse symptoms may include the following : Pain or irritation Watering Redness
Inhalation	Adverse symptoms may include the following : Respiratory tract irritation Coughing Wheezing and breathing difficulties Asthma
Skin contact	Adverse symptoms may include the following : Irritation Redness
Ingestion	No specific data.

11. Toxicological information

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects	Not available.
Potential delayed effects	Not available.

Long term exposure

Potential immediate effects	Not available.
Potential delayed effects	Not available.

Potential chronic health effects

Product/ ingredient name	Test	Endpoint	Species	Result
Isocyanic acid, polymethylenepoly phenylene ester	OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies	Chronic NOEC Inhalation Dusts and mists	Rat – Male, Female	0.2mg/m^3

General	May cause damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.
Carcinogenicity	Rats have been exposed for two years to a respirable aerosol of polymeric MDI which resulted in chronic pulmonary irritation at high concentrations. Only at the top level (6 mg/m^3), there was a significant incidence of a benign tumour of the lung (adenoma) and one malignant tumour (adenocarcinoma). There were no lung tumours at 1 mg/m^3 and no effects at 0.2 mg/m^3. Overall, the tumour incidence, both benign and malignant, and the number of animals with the tumours were not different from controls. The increase incidence of lung tumours is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung, which occured throughout the study. In the absence of prolonged exposure to high concentrations leading to chronic irritation and lung damage, it is highly unlikely that tumour formation will occur.
Mutagenicity	No known significant effects or critical hazards.
Teratogenicity	No known significant effects or critical hazards.
Developmental effects	No birth defects were seen in two independant animal (rat) studies. Fetotoxicity was observed at doses that were extremely toxic (including lethal) to the mother. Fetotoxicity was not observed at doses that were not maternally toxic. The doses used in these studies were maximal, respirable concentrations which are well in excess of defined occupational exposure limits.

11. Toxicological information

Fertility effects No known significant effecgts or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (dusts and mists	1.5 mg/l

Other information Not available.

12. Ecological information

Toxicity

Product/ ingredient name	Test	Endpoint	Exposure	Species	Result
Isocyanic acid, polymethylene polyphenylene ester	OECD 201 Alga, Growth Inhibition Test	Acute EC50	72 hours static	Algae	>1640 mg/l
	OECD 209 Activated Sludge, Respiration Inhibition Test	Acute EC50	3 hours static	Bacteria	>100 mg/l
	OECD 202 Daphnia sp. Acute Immobilisation Test	Acute EC50	24 hours static	Daphnia	>1000 mg/l
	-	Acute LC0	96 hours	Fish	>1000 mg/l
	OECD 203 Fish, Acute Toxicity test	Acute LC50	96 hours static	Fish	>1000 mg/l
	OECD 211 Daphnia Magna Reproduction Test	Chronic NOEC	21 days Semi-Static	Daphnia	>=10 mg/l

12. Ecological information

Product/ ingredient name	Test	Endpoint	Exposure	Species	Result
4,4'-Methylenediphenyl diisocyanate	OECD 201 Alga, Growth Inhibition test	Chronic NOECr	72 hours static	Algae	1640 mg/l
	OECD 202 Daphnia sp. Acute Immobilisation Test	Acute EC50	24 hours Static	Daphnia	>1000 mg/l
	OECD 203 Fish, Acute Toxicity Test	Acute LC50	96 hours Static	Fish	>1000 mg/l
	OECD 211 Daphnia Magna Reproduction Test	Chronic NOEC	21 dayx Semi-static	Daphnia	>=10 mg/l
	OECD 201 Alga, Growth Inhibition Test	Chronic NOECr	72 hours Static	Algae	1640 mg/l

Persistance and degradability

Product/ ingredient name	Test	Period	Result
Isocyanic acid, polymethylenepolyphenylene ester	OECD 302C Inherent Biodegradability Modified MITI Test (II)	28 days	0 %
4,4'-Methylenediphenyl diisocyanate	OECD 302C Inherent Biodegradability Modified MITI Test (II)	28 days	0 %

Conclusion/Summary

Isocyanic acid, Polymethylenepolyphenylene ester	Not biodegradable
4,4'-Methylenediphenyl diisocyanate	Not biodegradable

Product/ ingredient name	Aqua half-life	Photolysis	Biodegradability
Isocyanic acid, polymethylenepolyphenylene ester	Fresh water 0.8 days	-	Not readily

12. Ecological information

Product/ ingredient name	Aqua half-life	Photolysis	Biodegradability
4,4'-Methylenediphenyl diisocyanate	Fresh water 0.83 days	-	Not readily

Bioaccumulative potential

Product/ ingredient name	$LogP_{ow}$	BCF	Potential
Isocyanic acid, polymethylenepolyphenylene ester	-	200	Low
4,4'-Methylenediphenyl diisocyanate	4.51	200	low

Mobility in soil

Mobility By considering the production and use of the substance, it is unlikely that significant environmental exposure in the air or water will arise. Immiscible with water, but will react with water to produce inert and non-biodegradable solids. Conversion to soluble products, including diamino-diphenylmethane (MDA), is very low under the optimal laboratory conditions of good dispersion and low concentration. In air, the predominant degradation process is predicted to be a relatively rapid OH radical attack, by calculation and by analogy with related diisocyanates.

Other adverse effects No known significant effects or critical hazards.

Other ecological information

BOD5 Not determined
COD Not determined
TOC Not determined

13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

14. Transport information

Proper shipping name

DOT	OTHER REGULATED SUBSTANCES, LIQUID, N.O.S. (Methylene Diphenyl Diisocyanate)
TDG	Not regulated.
IMDG	Not regulated.
IATA	Not regulated.

Regulatory Information	UN number	Classes	PG*	Label	Additional Information
DOT Classification	NA3082	9	III		**<u>Reportable quantity 5000 lbs. (2270 kg)</u>** Single containers less than 5,000 lbs. are not reulated
TDG Classification	Not regulated.	-	-		-
IMDG Classification	Not regulated.	-	-		-
IATA Classification	Not regulated.	-	-		-

PG* : Packing group

15. Regulatory information

<u>Safety, health and environmental regulations specific for the product</u>

<u>United States regulations</u>

TSCA 9(b) inventory	All components are listed or exempted.
TSCA 5(a)2 final Significant new use rule (SNUR)	No ingredients listed.
TSCA 5 (e) substance consent order	No ingredients listed.
TSCA 12(b) export notification	No ingredients listed.
SARA 311/312	Immediate (acute) health hazard

15. Regulatory information

	Product name	Concentration %
Clean Air Act Section 112 (b) Hazardous Air Polluants (HAPs)	4,4'-Methylenediphenyl diisocyanate	36 - 42
Clean Air Act – Ozone Depleting Substances (ODS)	This product does not contain no ris it manufactured with ozone depleting substances.	
	Product name	**Concentration %**
SARA 313 Form R – Reporting requirements	Methylenediphenyldiisocyanate, isomers and homologues	51.5 - 62
	Diphenylmethane 4,4'-diisocyanate	36 – 42

	Ingredient name	%	Section 304 CERCLA Hazardous Substance	CERCLA Reportable Quantity (Lbs)	Product Reportable Quantity (Lbs)
CERCLA Hazardous substances	Diphenylmethane 4,4'-diisocyanate	42	Listed	5000	11905

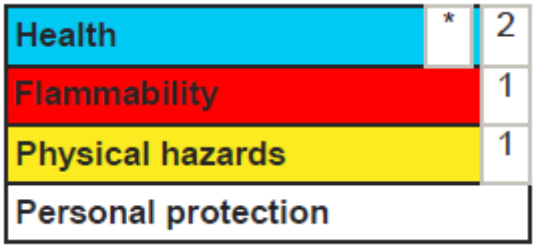
<u>Canadian regulations</u>

CEPA DSL	All components are listed or exempted.
WHMIS Classes	WHMIS Class D-2A : Material causing other toxic effects (very toxic). WHMIS Class D-2B : Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

16. Other information

Hazardous Material Information System (U.S.A.)



The customer is responsible for determining the PPE code for this material.

Caution : HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazard or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully emplented HMIS® program. HMIS® is a registered mark of the National Paint & Coating Association (NPCA). HMIS® materials may be purchased exclusively from J.J. Keller (800) 327-6868.

16. Other information

National Fire Protection Association (U.S.A.)

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Liquid decontaminants (percentages by weight or volume)
Decontaminant 1 : *-sodium carbonate : 5 – 10% *- liquid detergent : 0.2 – 2 % *-Water : to make up to 100%
Decontaminant 2 : *-concentrated ammonia solution : 3 – 8 % *-liquid detergent : 0.2% - 2% *-water : to make up to 100%
Decontaminant 1 reacts slower with diisocyanates but is more environmentally friendly than decontaminant 2.
Decontaminant 2 contains ammonia presents health hazards. (see suppier safety information).
Literature reference : PU 193-1 :'MDI-Based Compositions : Hazards and safe Handling Procedures.'
PU 181-15 : Recommended melting procedures for MDI-based isocyanates.
ISOPA Guidelines for safe Loading/Unloading, transportation, Storage of TDI and MDI, Ref.03+96 PSC-0005-GUIDL. SPI PMDI User Guidelines for the Chemical Protective Clothing Selection.
References of methods used in the Physico-Chemical Properties section are reported in Annex V part A to Commission Directive 92/69/EEC of 31 July 1992 adapting to technical progress for the Seventeenth time Council Directive 67/548/EEC.

Notice to reader

While the information ad recommendations in this publication are to the best of our knowledge, information and belief accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANGY, EXPRESS OR OTHERWISE.

IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.
THE PRODUCT MAY PRESENT HAZARDS AND SHOULD BE USED WITH CAUTION. WHILE CERTAIN HAZARDS ARE DESCRIBED IN THIS PUBLICATION, NO GUARANTEE IS MADE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.
Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent upon the manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.