ARATHANE® 5753 A

Version	Revision Date:	SDS Number:	Date of last issue: 08/26/2020
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SECTION 1. IDENTIFICATION

Product name : ARATHANE® 5753 A

Manufacturer or supplier's details

Company name of supplier : Huntsman Advanced Materials Americas LLC

Address : P.O. Box 4980
The Woodlands,
TX 77387
United States of America (USA)

Telephone : Non-Emergency: (800) 257-5547

E-mail address of person responsible for the SDS : Global_Product_EHS_AdMat@huntsman.com

Emergency telephone number : Chemtrec: (800) 424-9300 or (703) 527-3887

Recommended use of the chemical and restrictions on use

Recommended use : Component used for the manufacture of electrical insulation parts

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute toxicity (Inhalation) : Category 4

Skin irritation : Category 2

Eye irritation : Category 2A

Respiratory sensitisation : Category 1

Skin sensitisation : Category 1

Specific target organ toxicity - single exposure : Category 3 (Respiratory system)

Specific target organ toxicity - repeated exposure (Inhalation) : Category 2

Short-term (acute) aquatic hazard : Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H332 Harmful if inhaled.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335 May cause respiratory irritation.
H373 May cause damage to organs through prolonged or repeated exposure if inhaled.
H401 Toxic to aquatic life.

Precautionary statements : **Prevention:**
P260 Do not breathe mist or vapours.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P272 Contaminated work clothing must not be allowed out of the workplace.
P273 Avoid release to the environment.
P280 Wear protective gloves/ eye protection/ face protection.
P285 In case of inadequate ventilation wear respiratory protection.
Response:
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P342 + P311 If experiencing respiratory symptoms: Call a POISON CENTER/ doctor.
P362 Take off contaminated clothing and wash before reuse.
Storage:
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
Disposal:
P501 Dispose of contents/container to an approved facility in accordance with local, regional, national and international regulations.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration (% w/w)
4,4'-methylenediphenyl diisocyanate	101-68-8	50 - 70
Benzene, 1,1'-methylenebis[isocyanato-, homopolymer	39310-05-9	20 - 30
2,4'-methylenediphenyl diisocyanate	5873-54-1	1 - 5
triethyl phosphate	78-40-0	1 - 5

The specific chemical identity and/or exact percentage (concentration) of composition may be withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

General advice : Move out of dangerous area.
Do not leave the victim unattended.
Get medical attention immediately if symptoms occur.
Show this safety data sheet to the doctor in attendance.

If inhaled : If breathed in, move person into fresh air.
Call a physician or poison control centre immediately.
Keep patient warm and at rest.
Keep respiratory tract clear.
If breathing is difficult, give oxygen.
If breathing is irregular or stopped, administer artificial respiration.
If unconscious, place in recovery position and seek medical advice.
Consult a physician immediately if symptoms such as shortness of breath or asthma are observed.
A hyper-reactive response to even minimal concentrations of diisocyanates may develop in sensitised persons.
The exposed person may need to be kept under medical surveillance for 48 hours.
LC50 (rat) : ca. 490 mg/m³ (4 hours) : using experimentally produced respirable aerosol having aerodynamic diameter <5microns.
Methods used to generate the exposure concentrations in the animal studies use extreme laboratory conditions and does not represent actual exposure conditions of the material in the workplace, storage, transportation or expected use on the market due to the very low vapor pressure. Therefore, these test results cannot be used to for hazard classification of the

material. Rather, an acute toxicity estimate is calculated based on weight of evidence and expert judgement and is used to justify a modified classification for acute inhalation toxicity.

In case of skin contact	:	In case of contact, immediately flush skin with soap and plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before reuse. Thoroughly clean shoes before reuse. Call a physician if irritation develops or persists. An MDI study has demonstrated that a polyglycol-based skin cleanser (such as D-Tam™, PEG-400) or corn oil may be more effective than soap and water.
In case of eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If easy to do, remove contact lens, if worn. Protect unharmed eye. Keep eye wide open while rinsing. Seek medical advice.
If swallowed	:	Gently wipe or rinse the inside of the mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Keep respiratory tract clear. Keep at rest. If a person vomits when lying on his back, place him in the recovery position. Never give anything by mouth to an unconscious person. Take victim immediately to hospital. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	Severe allergic skin reactions, bronchiospasm and anaphylactic shock 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.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If potential for exposure exists refer to Section 8 for specific personal protective equipment. First Aid responders should pay attention to self-protection and use the recommended protective clothing

Notes to physician	:	Symptomatic and supportive therapy as needed. Following severe exposure medical follow-up should be monitored for at least 48 hours. The first aid procedure should be established in consultation with the doctor responsible for industrial medicine.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	Water may be used if no other available and then in copious quantities. Reaction between water and hot isocyanate may be vigorous.
Specific hazards during firefighting	:	Do not allow run-off from fire fighting to enter drains or water courses. The pressure in sealed containers can increase under the influence of heat. Exposure to decomposition products may be a hazard to health.
Hazardous combustion products	:	Combustion products may include: carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and HCN. In the event of extreme heat (>500 degrees C), aniline is suspected of being formed.
Specific extinguishing methods	:	Cool containers/tanks with water spray.
Further information	:	Standard procedure for chemical fires. Due to reaction with water producing CO2-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Prevent fire extinguishing water from contaminating surface water or the ground water system. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Special protective equipment for firefighters	:	Wear an approved positive pressure self-contained breathing apparatus in addition to standard fire fighting gear.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Immediately evacuate personnel to safe areas. Use personal protective equipment. If specialised clothing is required to deal with the spillage, take

note of any information in Section 8 on suitable and unsuitable materials.
Ensure adequate ventilation.
Keep people away from and upwind of spill/leak.
Only qualified personnel equipped with suitable protective equipment may intervene.
For additional precautions and advice on safe handling, see section 7.
Never return spills in original containers for re-use.
Make sure that there is a sufficient amount of neutralizing/ absorbent material near the storage area.
The danger areas must be delimited and identified using relevant warning and safety signs.
Treat recovered material as described in the section "Disposal considerations".
For disposal considerations see section 13.

Environmental precautions : Do not allow uncontrolled discharge of product into the environment.
Do not allow material to contaminate ground water system.
Prevent product from entering drains.
Prevent further leakage or spillage if safe to do so.
Local authorities should be advised if significant spillages cannot be contained.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Clean-up methods - small spillage
Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).
Clean contaminated surface thoroughly.
Sweep up or vacuum up spillage and collect in suitable container for disposal.
Neutralize small spillages with decontaminant.
The compositions of liquid decontaminants are given in Section 16.
Remove and dispose of residues.
Clean-up methods - large spillage
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:
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).
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.
Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Technical measures	:	Ensure that eyewash stations and safety showers are close to the workstation location.
Local/Total ventilation	:	Use only with adequate ventilation.
Advice on protection against fire and explosion	:	Normal measures for preventive fire protection.
Advice on safe handling	:	For personal protection see section 8. Avoid formation of aerosol. Do not breathe vapours or spray mist. Do not breathe vapours/dust. Do not swallow. Do not get in eyes or mouth or on skin. Do not get on skin or clothing. Avoid exposure - obtain special instructions before use. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. Keep container closed when not in use. Open drum carefully as content may be under pressure. Dispose of rinse water in accordance with local and national regulations. Persons susceptible to skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used. Industrial use of aprotic polar solvents for cleaning can release hazardous primary aromatic amines (>0.1%)
Conditions for safe storage	:	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labelled containers. Observe label precautions. Protect from moisture. Electrical installations / working materials must comply with the technological safety standards. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Materials to avoid	:	For incompatible materials please refer to Section 10 of this SDS.
Recommended storage temperature	:	64 - 104 °F / 18 - 40 °C

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type	Control	Basis

		(Form of exposure)	parameters / Permissible concentration	
4,4'-methylenediphenyl diisocyanate	101-68-8	TWA	0.005 ppm	ACGIH
		TWA	0.005 ppm 0.05 mg/m3	NIOSH REL
		C	0.02 ppm 0.2 mg/m3	NIOSH REL
		C	0.02 ppm 0.2 mg/m3	OSHA Z-1
		C	0.02 ppm 0.2 mg/m3	OSHA P0
2,4'-methylenediphenyl diisocyanate	5873-54-1	C	0.02 ppm 0.2 mg/m3	OSHA Z-1
		TWA	0.005 ppm 0.05 mg/m3	NIOSH REL
		C	0.02 ppm 0.2 mg/m3	NIOSH REL
		C	0.02 ppm 0.2 mg/m3	OSHA P0

Personal protective equipment

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.
In emergency, non-routine and unknown exposure situations, including confined space entries, a NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA)or a full facepiece pressure demand supplied air respirator (SAR) with auxiliary self-contained air supply, should be used.

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.
Protective gloves should be worn when handling freshly made polyurethane products to avoid contact with trace residual materials which may be hazardous in contact with skin.

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 than 240 minutes according to EN374) is recommended.

When only brief contact is expected, a glove with protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN374) is recommended.
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
By industrial use of aprotic polar solvents for cleaning : Butyl rubber (0.7mm), Nitrile rubber (0.4mm), Chloroprene (0.5mm)

Eye 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.
Chemical splash goggles.
Always wear eye protection when the potential for inadvertent eye contact with the product cannot be excluded.
Please follow all applicable local/national requirements when selecting protective measures for a specific workplace.
Ensure that eyewash stations and safety showers are close to the workstation location.

Skin and body protection : Impervious clothing
Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Recommended:
Overall (preferably heavy cotton) or Tyvek-Pro Tech 'C' , Tyvek Pro 'F' disposable coverall.

Protective measures : Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Ensure that eye flushing systems and safety showers are located close to the working place.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Wash face, hands and any exposed skin thoroughly after handling.
Remove contaminated clothing and protective equipment before entering eating areas.
When using do not eat, drink or smoke.
Contaminated work clothing should not be allowed out of the workplace.
Wash hands before breaks and immediately after handling the product.
Wash hands before breaks and at the end of workday.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	yellow
Odour	:	slight
Odour Threshold	:	No data is available on the product itself.
pH	:	substance/mixture reacts with water
Melting point/freezing point	:	No data available
Boiling point/boiling range	:	597 °F / 314 °C
Flash point	:	> 351 °F / > 177 °C Method: Pensky-Martens closed cup
Evaporation rate	:	No data is available on the product itself.
Flammability (solid, gas)	:	No data is available on the product itself.
Flammability (liquids)	:	No data is available on the product itself.
Upper explosion limit / Upper flammability limit	:	No data is available on the product itself.
Lower explosion limit / Lower flammability limit	:	No data is available on the product itself.
Vapour pressure	:	< 0.0004 hPa (77 °F / 25 °C)
Relative vapour density	:	No data is available on the product itself.
Relative density	:	1.2
Density	:	1.2 g/cm3
Solubility(ies)		
Water solubility	:	Water reactive
Solubility in other solvents	:	No data is available on the product itself.
Partition coefficient: n-octanol/water	:	No data is available on the product itself.
Auto-ignition temperature	:	No data is available on the product itself.
Decomposition temperature	:	No data is available on the product itself.
Self-Accelerating decomposition temperature (SADT)	:	No data is available on the product itself.

Viscosity		
Viscosity, dynamic	:	50 mPa.s (77 °F / 25 °C)
Explosive properties	:	No data is available on the product itself.
Oxidizing properties	:	No data is available on the product itself.
Molecular weight	:	No data available
Particle size	:	No data is available on the product itself.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No dangerous reaction known under conditions of normal use.
Chemical stability	:	Stable under normal conditions.
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 layer of polyurea is formed at the interface by liberating carbon dioxide gas.
Conditions to avoid	:	Extremes of temperature and direct sunlight. Exposure to air or moisture over prolonged periods.
Incompatible materials	:	Acids Amines Bases Metals water
Hazardous decomposition products	:	Combustion products may include: carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and HCN. In the event of extreme heat (>500 degrees C), aniline is suspected of being formed.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute inhalation toxicity	:	Assessment: The substance/mixture is not toxic on inhalation as defined by dangerous goods regulations. Remarks: Methods used to generate the exposure concentrations in the animal studies use extreme laboratory

conditions and does not represent actual exposure conditions of the material in the workplace, storage, transportation or expected use on the market due to the very low vapor pressure. Therefore, these test results cannot be used to for hazard classification of the material. Rather, an acute toxicity estimate is calculated based on weight of evidence and expert judgement and is used to justify a modified classification for acute inhalation toxicity.

Acute toxicity estimate: 1.53 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist
Method: Calculation method

Components:

4,4'-methylenediphenyl diisocyanate:

Acute inhalation toxicity : LC50 (Rat, male and female): 431.18 mg/m3
Exposure time: 4 h
Test atmosphere: dust/mist
Method: OECD Test Guideline 403
Assessment: The component/mixture is moderately toxic after short term inhalation.

Acute dermal toxicity : LD50 (Rabbit): > 9,400 mg/kg
Remarks: Information given is based on data obtained from similar substances.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Acute oral toxicity : LD50 (Rat, female): > 5,000 mg/kg
Method: OECD Test Guideline 425
Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat, male and female): 0.49 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist
Method: OECD Test Guideline 403
Assessment: The component/mixture is moderately toxic after short term inhalation.

Acute dermal toxicity : LD50 (Rabbit, male and female): > 9,400 mg/kg
Method: OECD Test Guideline 402

2,4'-methylenediphenyl diisocyanate:

Acute inhalation toxicity : LC50 (Rat): 0.49 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist
Assessment: The component/mixture is moderately toxic after short term inhalation.

Acute dermal toxicity : LD50 (Rabbit, male and female): > 9,400 mg/kg
Method: OECD Test Guideline 402

triethyl phosphate:

Acute oral toxicity	:	LD50 (Rat): 1,600 mg/kg Assessment: The component/mixture is moderately toxic after single ingestion.
Acute inhalation toxicity	:	LC50 (Rat, male and female): > 8817 mg/m3 Exposure time: 4 h Test atmosphere: dust/mist Method: OECD Test Guideline 403
Acute dermal toxicity	:	LD50 (Rabbit): > 20,000 mg/kg

Skin corrosion/irritation

Components:

4,4'-methylenediphenyl diisocyanate:

Species	:	Rabbit
Assessment	:	Irritating to skin.
Method	:	OECD Test Guideline 404
Result	:	Irritating to skin.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Species	:	Rabbit
Result	:	Skin irritation

2,4'-methylenediphenyl diisocyanate:

Species	:	Rabbit
Assessment	:	Irritant
Method	:	OECD Test Guideline 404
Result	:	Irritating to skin.

triethyl phosphate:

Species	:	Rabbit
Assessment	:	No skin irritation
Method	:	OECD Test Guideline 404
Result	:	No skin irritation

Serious eye damage/eye irritation

Components:

4,4'-methylenediphenyl diisocyanate:

Species	:	Rabbit
Result	:	Irritating to eyes.
Assessment	:	Irritating to eyes.
Method	:	OECD Test Guideline 405

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Species	:	Rabbit
Result	:	Mild eye irritation
Method	:	OECD Test Guideline 405

2,4'-methylenediphenyl diisocyanate:

Species	:	Humans
Result	:	Irritation to eyes, reversing within 7 days
Assessment	:	Mild eye irritant
Method	:	OECD Test Guideline 405
Remarks	:	Mild eye irritation

triethyl phosphate:

Species	:	Rabbit
Result	:	Eye irritation
Method	:	OECD Test Guideline 405

Respiratory or skin sensitisation

Components:

4,4'-methylenediphenyl diisocyanate:

Exposure routes	:	Skin
Species	:	Guinea pig
Assessment	:	May cause sensitisation by skin contact.
Method	:	OECD Test Guideline 406
Result	:	May cause sensitisation by skin contact.

Test Type	:	Local lymph node assay (LLNA)
Exposure routes	:	Respiratory Tract
Species	:	Guinea pig
Assessment	:	May cause sensitisation by inhalation.
Result	:	May cause sensitisation by inhalation.

Assessment	:	May cause allergy or asthma symptoms or breathing difficulties if inhaled., May cause an allergic skin reaction.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Exposure routes	:	Skin
Species	:	Guinea pig
Method	:	OECD Test Guideline 406
Result	:	May cause sensitisation by skin contact.

Exposure routes	:	Respiratory Tract
Species	:	Guinea pig
Result	:	May cause sensitisation by inhalation.

Assessment	:	May cause sensitisation by inhalation and skin contact.

2,4'-methylenediphenyl diisocyanate:

Exposure routes	:	Skin
Species	:	Mouse
Assessment	:	May cause sensitisation by skin contact.
Result	:	Causes sensitisation.

Exposure routes	:	Respiratory Tract
Species	:	Guinea pig

Assessment : May cause sensitisation by inhalation.
Result : Causes sensitisation.

Assessment : Mild eye irritation

triethyl phosphate:

Exposure routes : Skin
Species : Mouse
Method : OECD Test Guideline 429
Result : Does not cause skin sensitisation.

Germ cell mutagenicity

Components:

4,4'-methylenediphenyl diisocyanate:

Genotoxicity in vitro : Test Type: reverse mutation assay
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: Directive 67/548/EEC, Annex, B.13/14
Result: negative

Genotoxicity in vivo : Test Type: Micronucleus test
Species: Rat (male)
Cell type: Somatic
Application Route: Inhalation
Exposure time: 3 Weeks
Dose: 113 mg/m3
Method: OECD Test Guideline 474
Result: negative

Test Type: comet assay
Species: Rat (male)
Cell type: Liver cells
Application Route: inhalation (dust/mist/fume)
Dose: 2.5/4.9/12 mg/m3
Method: OECD Test Guideline 489
Result: negative

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Genotoxicity in vitro : Concentration: ca 50 ug/plate
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Genotoxicity in vivo : Application Route: Inhalation
Exposure time: 3 Weeks
Dose: 118 mg/m3
Method: OECD Test Guideline 474
Result: negative

Germ cell mutagenicity - Assessment : Animal testing did not show any mutagenic effects.

2,4'-methylenediphenyl diisocyanate:

Genotoxicity in vitro : Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative

Genotoxicity in vivo : Application Route: Inhalation
Exposure time: 3 w
Dose: 118 mg/m3
Method: OECD Test Guideline 474
Result: negative

triethyl phosphate:

Genotoxicity in vitro : Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative

Method: OECD Test Guideline 482
Result: negative

Genotoxicity in vivo : Application Route: Intraperitoneal injection
Method: OECD Test Guideline 478
Result: negative

Carcinogenicity

Product:

Remarks : Rats have been exposed for two years to a respirable aerosol of polymeric MDI which resulted in a chronic pulmonary irritation at high concentrations. Only at the top level (6 mg/m3), 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/m3 and no effects at 0.2 mg/m3. Overall, the tumour incidence, both benign and malignant, and the number of animals with the tumours were not different from controls. The increased incidence of lung tumours is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung, which occurred 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.

Remarks : Industrial use of aprotic polar solvents for cleaning can release hazardous primary aromatic amines (>0.1%)
Based on animal studies, primary aromatic amines are considered as potential carcinogen to humans. Some of those chemicals are proven carcinogens to humans
Provided the recommended personal protective equipment and hygiene measures are applied, no adverse effects to human health are to be expected

Components:

4,4'-methylenediphenyl diisocyanate:

Species : Rat, female

Application Route	:	Inhalation
Exposure time	:	24 month(s)
Activity duration	:	17 h
Dose	:	0, 0.2, 0.7, 2.1 mg/m3 mg/m³
Frequency of Treatment	:	5 days/week
NOEL	:	0.7 mg/m³
LOAEL	:	0.23 mg/m³
Result	:	positive
Target Organs	:	Lungs

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Species	:	Rat, male and female
Application Route	:	Inhalation
Exposure time	:	24 month(s)
Dose	:	1 mg/m³
Frequency of Treatment	:	5 daily
Method	:	OECD Test Guideline 453
Result	:	negative

2,4'-methylenediphenyl diisocyanate:

Species	:	Rat, male and female
Application Route	:	Inhalation
Exposure time	:	24 month(s)
Dose	:	1 mg/m³
Frequency of Treatment	:	5 daily
Method	:	OECD Test Guideline 453
Result	:	positive
Target Organs	:	Lungs

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Components:

4,4'-methylenediphenyl diisocyanate:

Effects on foetal development	:	Test Type: Pre-natal Species: Rat, female Application Route: Inhalation Dose: 0/1/3/9 mg/m3 Duration of Single Treatment: 10 d Frequency of Treatment: 7 days/week General Toxicity Maternal: LOAEL: 9 mg/m³ Developmental Toxicity: NOAEC: 3 mg/m³ Method: OECD Test Guideline 414

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Effects on foetal development : Species: Rat, female
Application Route: Inhalation
General Toxicity Maternal: NOAEL: 4 mg/m³
Method: OECD Test Guideline 414
Result: No teratogenic effects

Reproductive toxicity - Assessment : No evidence of adverse effects on sexual function and fertility, or on development, based on animal experiments.

2,4'-methylenediphenyl diisocyanate:

Effects on fertility : Species: Rat, female
Application Route: Inhalation
Method: OECD Test Guideline 414
Result: Animal testing did not show any effects on fertility.

Species: Rat, male and female
Application Route: Inhalation
Method: OECD Test Guideline 414
Result: Animal testing did not show any effects on fertility.

Effects on foetal development : Species: Rat, male and female
Application Route: Inhalation
General Toxicity Maternal: NOAEL: 4 mg/m³
Method: OECD Test Guideline 414
Result: No teratogenic effects

triethyl phosphate:

Effects on foetal development : Species: Rat
Application Route: Oral
General Toxicity Maternal: NOAEL: 125 mg/kg body weight
Method: OECD Test Guideline 414
Result: No teratogenic effects

STOT - single exposure

Components:

4,4'-methylenediphenyl diisocyanate:

Exposure routes : Inhalation
Target Organs : Respiratory Tract
Assessment : May cause respiratory irritation., The substance or mixture is classified as specific target organ toxicant, single exposure, category 3 with respiratory tract irritation.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Exposure routes : inhalation (dust/mist/fume)
Target Organs : Respiratory Tract
Assessment : May cause respiratory irritation.

2,4'-methylenediphenyl diisocyanate:

Exposure routes : Inhalation
Target Organs : Respiratory system
Assessment : The substance or mixture is classified as specific target organ

toxicant, single exposure, category 3 with respiratory tract irritation.

STOT - repeated exposure

Components:

4,4'-methylenediphenyl diisocyanate:

Exposure routes	:	Inhalation
Target Organs	:	Respiratory system
Assessment	:	May cause damage to organs through prolonged or repeated exposure., The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2.

Repeated dose toxicity

Components:

4,4'-methylenediphenyl diisocyanate:

Species	:	Rat, female
LOEC	:	1 mg/m3
Application Route	:	Inhalation
Test atmosphere	:	dust/mist
Exposure time	:	2 years 17 h
Number of exposures	:	5 days/week
Dose	:	0, 0.2, 0.7, 2.1 mg/m3
Method	:	Chronic toxicity
Assessment	:	The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Species	:	Rat, male and female
NOEC	:	0.2 mg/m3
Test atmosphere	:	dust/mist
Exposure time	:	2 yr
Number of exposures	:	5 d
Method	:	OECD Test Guideline 453
Repeated dose toxicity - Assessment	:	No adverse effect has been observed in chronic toxicity tests.

2,4'-methylenediphenyl diisocyanate:

Species	:	Rat, male and female
NOEC	:	0.2 mg/m3
Exposure time	:	2 yr
Number of exposures	:	5 d
Method	:	OECD Test Guideline 453
Repeated dose toxicity - Assessment	:	Mild eye irritation

triethyl phosphate:

Species	:	Rat, male and female
NOAEL	:	1000 mg/kg

Application Route	:	Ingestion
Exposure time	:	4 Weeks
Number of exposures	:	7 d
Method	:	Subacute toxicity

Aspiration toxicity

No data available

Experience with human exposure

No data available

Toxicology, Metabolism, Distribution

No data available

Neurological effects

No data available

Further information

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

4,4'-methylenediphenyl diisocyanate:

Toxicity to fish	:	LC50 (Brachydanio rerio (zebrafish)): > 100 mg/l End point: mortality Exposure time: 96 h Test substance: Fresh water Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EL50 (Daphnia magna (Water flea)): 9 mg/l End point: Immobilization Exposure time: 48 h Test Type: semi-static test Test substance: Fresh water Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	EC50 (Desmodesmus subspicatus (green algae)): > 100 mg/l Exposure time: 72 h Test Type: static test Test substance: Fresh water Method: OECD Test Guideline 201 GLP: yes
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): >= 10 mg/l Exposure time: 21 d Test Type: semi-static test Test substance: Fresh water Method: OECD Test Guideline 211 Remarks: Information given is based on data obtained from similar substances.
Toxicity to microorganisms	:	EC50 (activated sludge): > 1,000 mg/l Exposure time: 3 h

Test Type: static test
Method: OECD Test Guideline 209

Toxicity to soil dwelling organisms : NOEC (Eisenia fetida (earthworms)): >= 1,000 mg/kg
Exposure time: 336 h

Plant toxicity : EC50: >1000 milligram per kilogram
Exposure time: 14 d
Species: Avena sativa (oats)

EC50: >1000 milligram per kilogram
Exposure time: 14 d
Species: Lactuca sativa (lettuce)

Ecotoxicology Assessment

Acute aquatic toxicity : Toxic to aquatic life.

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Toxicity to fish : LC50 (Brachydanio rerio (zebrafish)): > 1,000 mg/l
Exposure time: 96 h
Test Type: static test
Test substance: Fresh water
Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): > 1,000 mg/l
Exposure time: 24 h
Test Type: static test
Test substance: Fresh water
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : EC50 (Desmodesmus subspicatus (green algae)): > 1,640 mg/l
Exposure time: 72 h
Test Type: static test
Test substance: Fresh water
Method: OECD Test Guideline 201

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : NOEC (Daphnia magna (Water flea)): >= 10 mg/l
Exposure time: 21 d
Test Type: semi-static test
Test substance: Fresh water
Method: OECD Test Guideline 211

Toxicity to microorganisms : EC50 (activated sludge): > 100 mg/l
Exposure time: 3 h
Test Type: static test
Test substance: Fresh water
Method: OECD Test Guideline 209

Toxicity to soil dwelling organisms : EC50 (Eisenia fetida (earthworms)): > 1,000 mg/kg
Exposure time: 336 h
Method: OECD Test Guideline 207

2,4'-methylenediphenyl diisocyanate:

Toxicity to fish	:	LC50 (Brachydanio rerio (zebrafish)): > 1,000 mg/l Exposure time: 96 h Test Type: static test Test substance: Fresh water Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EL50 (Daphnia magna (Water flea)): 3.7 mg/l Exposure time: 48 h Test Type: semi-static test Test substance: Fresh water Method: OECD Test Guideline 202
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): >= 10 mg/l Exposure time: 21 d Test Type: semi-static test Test substance: Fresh water Method: OECD Test Guideline 211
Toxicity to microorganisms	:	EC50 (activated sludge): > 100 mg/l Exposure time: 3 h Test Type: static test Test substance: Fresh water Method: OECD Test Guideline 209
Toxicity to soil dwelling organisms	:	NOEC (Eisenia fetida (earthworms)): >= 1,000 mg/kg Exposure time: 336 h Method: OECD Test Guideline 207

Ecotoxicology Assessment

Acute aquatic toxicity	:	Toxic to aquatic life.

triethyl phosphate:

Toxicity to fish	:	LC50 (Pimephales promelas (fathead minnow)): > 100 mg/l Exposure time: 96 h Test Type: static test Test substance: Fresh water
Toxicity to daphnia and other aquatic invertebrates	:	LC50: > 100 mg/l Exposure time: 96 h Test Type: static test Test substance: Fresh water
Toxicity to algae/aquatic plants	:	EC50 (Desmodesmus subspicatus (green algae)): 901 mg/l Exposure time: 72 h Test Type: static test Test substance: Fresh water
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): 31.6 mg/l Exposure time: 21 d Test substance: Fresh water Method: OECD Test Guideline 211
Toxicity to microorganisms	:	(Pseudomonas putida): 2,985 mg/l Exposure time: 0.5 h Test Type: static test

Test substance: Fresh water

Persistence and degradability

Components:

4,4'-methylenediphenyl diisocyanate:

Biodegradability : aerobic
Inoculum: activated sludge, non-adapted
Result: Not readily biodegradable.
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 301F
Test substance: Fresh water

Stability in water : Degradation half life (DT50): 20 hrs (25 °C)
Remarks: Fresh water

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Biodegradability : Inoculum: Domestic sewage
Concentration: 30 mg/l
Result: Not biodegradable
Biodegradation: 0 %
Exposure time: 28 d
Method: Inherent Biodegradability: Modified MITI Test (II)

2,4'-methylenediphenyl diisocyanate:

Biodegradability : Inoculum: Domestic sewage
Concentration: 30 mg/l
Result: Not biodegradable
Biodegradation: 0 %
Exposure time: 28 d
Method: Inherent Biodegradability: Modified MITI Test (II)

triethyl phosphate:

Biodegradability : Inoculum: activated sludge
Result: Not readily biodegradable.
Biodegradation: 0 %
Exposure time: 28 d
Method: OECD Test Guideline 301C

Inoculum: activated sludge
Result: Inherently biodegradable.
Biodegradation: 98 %
Exposure time: 28 d
Method: OECD Test Guideline 302B

Stability in water : Degradation half life (DT50): 5.5 yr (25 °C) pH: 7

Remarks: Fresh water

Bioaccumulative potential

Components:

4,4'-methylenediphenyl diisocyanate:

Bioaccumulation	:	Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 200 Exposure time: 28 d Concentration: 0.08 µg/l Method: OECD Test Guideline 305 Remarks: Bioaccumulation is unlikely.
Partition coefficient: n-octanol/water	:	log Pow: 4.51 (72 °F / 22 °C) pH: 7 Method: OECD Test Guideline 117

Benzene, 1,1'-methylenebis[isocyanato-, homopolymer:

Bioaccumulation	:	Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 200 Remarks: Bioaccumulation is unlikely.
Partition coefficient: n-octanol/water	:	log Pow: 8.56 (68 °F / 20 °C)

2,4'-methylenediphenyl diisocyanate:

Bioaccumulation	:	Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 200 Remarks: Bioaccumulation is unlikely.
Partition coefficient: n-octanol/water	:	log Pow: 4.51 (68 °F / 20 °C) pH: 7 Method: OECD Test Guideline 117

triethyl phosphate:

Bioaccumulation	:	Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 0.5 - 0.8 Exposure time: 42 d Test substance: Fresh water Method: semi-static test
Partition coefficient: n-octanol/water	:	log Pow: 1.11 Method: Partition coefficient

Mobility in soil

Components:

4,4'-methylenediphenyl diisocyanate:

Distribution among environmental compartments	:	log Koc: 4.5 Method: QSAR
Stability in soil	:	Soil temperature: 72 °F / 22 °C

Dissipation time: 24 h
Method: OECD Test Guideline 307

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
Additional ecological information	:	No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.
Contaminated packaging	:	Empty remaining contents. Dispose of as unused product. Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulations

UNRTDG
Not regulated as dangerous goods

IATA-DGR
Not regulated as dangerous goods

IMDG-Code
Not regulated as dangerous goods

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

49 CFR

UN/ID/NA number	:	NA 3082
Proper shipping name	:	Other regulated substances, liquid, n.o.s. (Methylene Diphenyl Diisocyanate)
Class	:	9
Packing group	:	III
Labels	:	CLASS 9
ERG Code	:	171

Marine pollutant : no

Special precautions for user

Remarks : 49CFR: no dangerous good in non-bulk packaging

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
4,4'-methylenediphenyl diisocyanate	101-68-8	5000	7575

SARA 311/312 Hazards : Acute toxicity (any route of exposure)
Respiratory or skin sensitisation
Skin corrosion or irritation
Serious eye damage or eye irritation
Specific target organ toxicity (single or repeated exposure)

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

4,4'-methylenediphenyl diisocyanate	101-68-8	>= 50 - < 70 %

The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

4,4'-methylenediphenyl diisocyanate	101-68-8

California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

DSL : All components of this product are on the Canadian DSL

AIIC : On the inventory, or in compliance with the inventory

NZIoC : On the inventory, or in compliance with the inventory

ENCS : On the inventory, or in compliance with the inventory

KECI : On the inventory, or in compliance with the inventory

PICCS : On the inventory, or in compliance with the inventory

IECSC : On the inventory, or in compliance with the inventory

TCSI : On the inventory, or in compliance with the inventory

TSCA : All substances listed as active on the TSCA inventory

Inventories

AIIC (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan), TECI (Thailand), TSCA (USA)

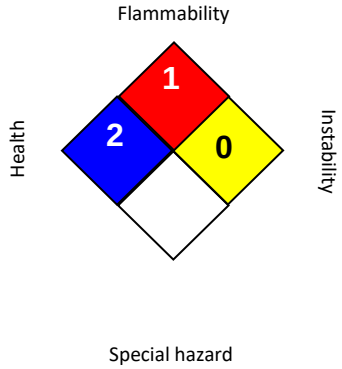
TSCA - 5(a) Significant New Use Rule List of Chemicals
No substances are subject to a Significant New Use Rule.

US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)
No substances are subject to TSCA 12(b) export notification requirements.

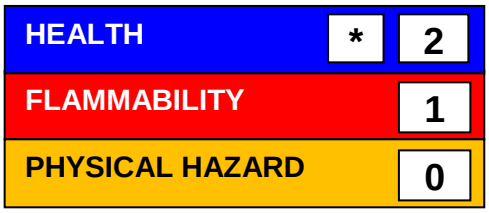
SECTION 16. OTHER INFORMATION

Further information

NFPA 704:



HMIS® IV:



HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. The "*" represents a chronic hazard, while the "/" represents the absence of a chronic hazard

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. Ammonia presents health hazards. (See supplier safety information.)

Revision Date : 05/02/2022

ACGIH : USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL : USA. NIOSH Recommended Exposure Limits
OSHA P0 : USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)

OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / C	:	Ceiling value not be exceeded at any time.
OSHA P0 / C	:	Ceiling limit
OSHA Z-1 / C	:	Ceiling

The information and 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 WARRANTY, EXPRESS OR OTHERWISE.

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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.

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