

**ARALDITE® 2028-1 ISOCYANATE**

Version 1.0      Revision Date: 06/26/2018      SDS Number: 400001015061      Date of last issue: -  
Date of first issue: 06/26/2018

**SECTION 1. IDENTIFICATION**

Product name : ARALDITE® 2028-1 ISOCYANATE

**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 : MSDS@huntsman.com  
Emergency telephone number : Chemtrec: (800) 424-9300 or (703) 527-3887

**Recommended use of the chemical and restrictions on use**

Recommended use : Adhesives

**SECTION 2. HAZARDS IDENTIFICATION****GHS classification in accordance with 29 CFR 1910.1200**

Respiratory sensitisation : Category 1

Skin sensitisation : Category 1

**GHS label elements**

Hazard pictograms :

Signal word : Danger

Hazard statements : H317 May cause an allergic skin reaction.  
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Precautionary statements : **Prevention:**  
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.  
P272 Contaminated work clothing should not be allowed out of the workplace.  
P280 Wear protective gloves.  
P285 In case of inadequate ventilation wear respiratory protection.  
**Response:**  
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.  
P304 + P341 IF INHALED: If breathing is difficult, remove victim

**ARALDITE® 2028-1 ISOCYANATE**

Version 1.0      Revision Date: 06/26/2018      SDS Number: 400001015061      Date of last issue: -  
Date of first issue: 06/26/2018

to fresh air and keep at rest in a position comfortable for breathing.  
P333 + P313 If skin irritation or rash occurs: Get medical advice/attention.  
P342 + P311 If experiencing respiratory symptoms: Call a POISON CENTER/doctor.  
P363 Wash contaminated clothing before reuse.

**Storage:**

Not available

**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 : Substance

**Hazardous components**

Chemical name	CAS-No.	Concentration (% w/w)
Hexamethylene diisocyanate, oligomers	28182-81-2	90 - 100
hexamethylene diisocyanate	822-06-0	0.1 - 1

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.  
Show this safety data sheet to the doctor in attendance.  
Treat symptomatically.  
Get medical attention if symptoms occur.

If inhaled : Call a physician or poison control centre immediately.  
If inhaled, remove to fresh air.  
Get medical attention if symptoms occur.

In case of skin contact : If on skin, rinse well with water.

In case of eye contact : Flush eyes with water as a precaution.  
Remove contact lenses.  
Keep eye wide open while rinsing.  
If eye irritation persists, consult a specialist.

If swallowed : Keep respiratory tract clear.  
Never give anything by mouth to an unconscious person.  
If symptoms persist, call a physician.  
Take victim immediately to hospital.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

Most important symptoms and effects, both acute and delayed : None known.

Notes to physician : No information available.

Treat symptomatically.

**SECTION 5. FIREFIGHTING MEASURES**

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media : High volume water jet

Specific hazards during firefighting : No information available.

No information available.

Hazardous combustion products : No hazardous combustion products are known

Specific extinguishing methods : No data is available on the product itself.

Further information : No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary.

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.  
Ensure adequate ventilation.  
Refer to protective measures listed in sections 7 and 8.

Environmental precautions : Prevent product from entering drains.  
Prevent further leakage or spillage if safe to do so.  
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).  
Keep in suitable, closed containers for disposal.

**SECTION 7. HANDLING AND STORAGE**

Advice on protection against : Normal measures for preventive fire protection.

## ARALDITE® 2028-1 ISOCYANATE

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

fire and explosion

Advice on safe handling : Avoid formation of aerosol.  
Do not breathe vapours/dust.  
Avoid exposure - obtain special instructions before use.  
Avoid contact with skin and eyes.  
For personal protection see section 8.  
Smoking, eating and drinking should be prohibited in the application area.  
Provide sufficient air exchange and/or exhaust in work rooms.  
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.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.  
Keep in properly labelled containers.

Materials to avoid : water  
  
For incompatible materials please refer to Section 10 of this SDS.

Further information on storage stability : Stable under normal conditions.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

## Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
hexamethylene diisocyanate	822-06-0	TWA	0.005 ppm	ACGIH

## Personal protective equipment

Respiratory protection : In the case of vapour formation use a respirator with an approved filter.

Hand protection

Material : butyl-rubber  
Break through time : > 8 h

Material : Nitrile rubber  
Break through time : 10 - 480 min

Material : Neoprene gloves  
Break through time : 10 - 480 min

Material : PVC

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

Eye protection : Eye wash bottle with pure water  
Tightly fitting safety goggles

Skin and body protection : Impervious clothing  
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures : 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 : Not applicable

Melting point/range : No data available

Boiling point/boiling range : No data available

Flash point : 358 °F / 181 °C  
Method: 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 : < 0.0001 hPa (68 °F / 20 °C)

Relative vapour density : No data is available on the product itself.

Relative density : 1.14 (68 °F / 20 °C)

Density : ca. 1.14 g/cm<sup>3</sup> (68 °F / 20 °C)

Solubility(ies)  
Water solubility : insoluble (68 °F / 20 °C)

Solubility in other solvents : No data is available on the product itself.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

Partition coefficient: n-octanol/water : No data is available on the product itself.

Auto-ignition temperature : ca.896 °F / 480 °C  
Method: DIN Method, other

Thermal decomposition : No data is available on the product itself.

Self-Accelerating decomposition temperature (SADT) : No data is available on the product itself.

Viscosity  
Viscosity, dynamic : 10,000 mPa.s (73 °F / 23 °C)  
Method: ISO 3219

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 : No decomposition if stored and applied as directed.  
Stable under normal conditions.

Possibility of hazardous reactions : Decomposes when moist.  
  
No decomposition if stored and applied as directed.  
  
No hazards to be specially mentioned.

Conditions to avoid : Exposure to moisture  
  
No data available  
  
None known.

Incompatible materials : No data available  
  
None known.

Hazardous decomposition products : Carbon oxides  
  
Nitrogen oxides (NOx)  
  
No hazardous decomposition products are known.

**SECTION 11. TOXICOLOGICAL INFORMATION**

Information on likely routes of : No data is available on the product itself.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

exposure

**Acute toxicity****Components:**

Hexamethylene diisocyanate, oligomers:

Acute oral toxicityComponents : LD50 (Rat): &gt; 5,000 mg/kg

hexamethylene diisocyanate:

Acute oral toxicityComponents : LD50 (Rat, male): 959 mg/kg  
Method: OECD Test Guideline 401LD50 (Rat, male): 746 mg/kg  
Method: OECD Test Guideline 401Acute inhalation toxicity - Product : Acute toxicity estimate: 41.33 mg/  
Exposure time: 4 h  
Test atmosphere: vapour  
Method: Calculation method**Components:**

Hexamethylene diisocyanate, oligomers:

Acute dermal toxicity : LD50 (Rabbit): > 2,000 mg/kg  
Assessment: The substance or mixture has no acute dermal toxicity

hexamethylene diisocyanate:

Acute dermal toxicity : LD50 (Rat, male and female): > 7,000 mg/kg  
Method: OECD Test Guideline 402

Acute toxicity (other routes of administration) : No data available

**Skin corrosion/irritation****Components:**

Hexamethylene diisocyanate, oligomers:

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

hexamethylene diisocyanate:

Species: Rabbit  
Exposure time: 4 h  
Method: OECD Test Guideline 404  
Result: Corrosive after 1 to 4 hours of exposure**Serious eye damage/eye irritation****Components:**

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

Hexamethylene diisocyanate, oligomers:

Species: Rabbit

Result: No eye irritation

Method: OECD Test Guideline 405

hexamethylene diisocyanate:

Species: Rabbit

Result: Irreversible effects on the eye

Method: OECD Test Guideline 405

**Respiratory or skin sensitisation****Components:**

Hexamethylene diisocyanate, oligomers:

Exposure routes: Skin

Species: Guinea pig

Assessment: May cause sensitisation by skin contact.

Method: OECD Test Guideline 406

hexamethylene diisocyanate:

Test Type: Maximisation Test

Exposure routes: Skin

Species: Rabbit

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.

**Components:**

hexamethylene diisocyanate:

Assessment: Harmful if inhaled., Causes skin irritation., Causes serious eye irritation.

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

**Germ cell mutagenicity****Components:**

Hexamethylene diisocyanate, oligomers:

Genotoxicity in vitro : Metabolic activation: with and without metabolic activation  
Result: negative

hexamethylene diisocyanate:

Genotoxicity in vitro : Test Type: In vitro mammalian cell gene mutation test  
Test system: Chinese hamster ovary cells  
Concentration: 1,0 - 10 ml  
Metabolic activation: with and without metabolic activation  
Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Concentration: 6, 12, 20, 25, 50 and 150 µL p

Metabolic activation: with and without metabolic activation



**ARALDITE® 2028-1 ISOCYANATE**

Version 1.0      Revision Date: 06/26/2018      SDS Number: 400001015061      Date of last issue: -  
Date of first issue: 06/26/2018

Result: negative

**Components:**

hexamethylene diisocyanate:

Genotoxicity in vivo

: Test Type: Micronucleus test  
Species: Mouse (male and female)  
Cell type: Bone marrow  
Application Route: Inhalation  
Exposure time: 6 h  
Dose: 1.47 ppm  
Method: OECD Test Guideline 474  
Result: negative

**Carcinogenicity****Components:**

hexamethylene diisocyanate:

Species: Rat, male and female

Application Route: Inhalation

Exposure time: 24 month(s)

Dose: 0,164 ppm

Frequency of Treatment: 6 hour

Method: OECD Test Guideline 453

Result: negative

Carcinogenicity -  
Assessment

: No data available

**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.

**ACGIH**

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

**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:**

hexamethylene diisocyanate:

Effects on fertility

: Species: Rat, male and female  
Application Route: Inhalation  
Target Organs: Nasal inner lining  
Method: OECD Test Guideline 422  
Result: negative

**Components:**

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

hexamethylene diisocyanate:  
Effects on foetal development : Species: Rat, male and female  
Application Route: Inhalation  
General Toxicity Maternal: No observed adverse effect level:  
0.005 ppm  
Method: OECD Test Guideline 414  
Result: No teratogenic effects

Reproductive toxicity - Assessment : No data available

**STOT - single exposure****Components:**

hexamethylene diisocyanate:  
Exposure routes: Inhalation  
Target Organs: Respiratory Tract  
Assessment: Causes damage to organs.

**STOT - repeated exposure****Components:**

hexamethylene diisocyanate:  
Target Organs: Nasal inner lining  
Assessment: Causes damage to organs through prolonged or repeated exposure.

**Repeated dose toxicity****Components:**

Hexamethylene diisocyanate, oligomers:  
Species: Rat  
: 3.7 - 4.3 mg/m<sup>3</sup>  
Exposure time: 3 Weeks

Species: Rat  
: 3.3 - 3.4 mg/m<sup>3</sup>  
Exposure time: 2,160 h

hexamethylene diisocyanate:  
Species: Rat, male and female  
: 0.005 ppm  
Application Route: inhalation (vapour)  
Test atmosphere: vapour  
Exposure time: 2 yr  
Number of exposures: 6 h  
Method: OECD Test Guideline 453

**Components:**

hexamethylene diisocyanate:  
Repeated dose toxicity - Assessment : Harmful if inhaled., Causes skin irritation., Causes serious eye irritation.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

**Aspiration toxicity**

No data available

**Experience with human exposure**

General Information: No data available

Inhalation: No data available

Skin contact: No data available

Eye contact: No data available

Ingestion: No data available

**Toxicology, Metabolism, Distribution**

No data available

**Neurological effects**

No data available

**Further information**

Ingestion: No data available

**SECTION 12. ECOLOGICAL INFORMATION****Ecotoxicity****Components:**

Hexamethylene diisocyanate, oligomers:

Toxicity to fish : LC50 (Brachydanio rerio (zebrafish)): > 100 mg/l  
Exposure time: 96 h

hexamethylene diisocyanate:

Toxicity to fish : LC50 (Brachydanio rerio (zebrafish)): > 82.8 mg/l  
Exposure time: 96 h  
Test Type: static test  
Test substance: Fresh water  
Method: Directive 67/548/EEC, Annex V, C.1.**Components:**

Hexamethylene diisocyanate, oligomers:

Toxicity to daphnia and other aquatic invertebrates : LC50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

hexamethylene diisocyanate:  
Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): > 89.1 mg/l  
Exposure time: 48 h  
Test Type: static test  
Test substance: Fresh water  
Method: Directive 67/548/EEC, Annex V, C.2.

**Components:**

Hexamethylene diisocyanate, oligomers:  
Toxicity to algae : EC50 (Desmodesmus subspicatus (green algae)): > 1,000 mg/l  
Exposure time: 72 h

hexamethylene diisocyanate:  
Toxicity to algae : EgC50 (Desmodesmus subspicatus (green algae)): > 77.4 mg/l  
Exposure time: 72 h  
Test Type: static test  
Test substance: Fresh water  
Method: Directive 67/548/EEC, Annex V, C.3.

M-Factor (Acute aquatic toxicity) : No data available

Toxicity to fish (Chronic toxicity) : No data available

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : No data available

M-Factor (Chronic aquatic toxicity) : No data available

**Components:**

Hexamethylene diisocyanate, oligomers:  
Toxicity to microorganisms : EC50 (activated sludge): > 1,000 mg/l  
Exposure time: 3 h

hexamethylene diisocyanate:  
Toxicity to microorganisms : EC50 (activated sludge): 842 mg/l  
Exposure time: 3 h  
Test Type: static test  
Test substance: Fresh water  
Method: OECD Test Guideline 209

Toxicity to soil dwelling organisms : No data available

Plant toxicity : No data available

Sediment toxicity : No data available

Toxicity to terrestrial : No data available

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

organisms

Ecotoxicology Assessment

**Components:**

hexamethylene diisocyanate:

Acute aquatic toxicity : This product has no known ecotoxicological effects.

**Components:**

hexamethylene diisocyanate:

Chronic aquatic toxicity : This product has no known ecotoxicological effects.

Toxicity Data on Soil : No data available

Other organisms relevant to the environment : No data available

**Persistence and degradability****Components:**

Hexamethylene diisocyanate, oligomers:

Biodegradability : Result: Not biodegradable  
Biodegradation: 0 %  
Exposure time: 28 d

hexamethylene diisocyanate:

Biodegradability : Inoculum: activated sludge  
Concentration: 100 mg/l  
Result: Not readily biodegradable.  
Biodegradation: 48 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301F

Biochemical Oxygen Demand (BOD) : No data available

Chemical Oxygen Demand (COD) : No data available

BOD/COD : No data available

ThOD : No data available

BOD/ThOD : No data available

Dissolved organic carbon (DOC) : No data available

Physico-chemical removability : No data available

Stability in water : No data available

Photodegradation : No data available

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

Impact on Sewage Treatment : No data available

**Bioaccumulative potential****Components:**

hexamethylene diisocyanate:  
Bioaccumulation : Bioconcentration factor (BCF): 3.2  
Remarks: Bioaccumulation is unlikely.

Partition coefficient: n-octanol/water : No data available

**Mobility in soil**

Mobility : No data available

**Components:**

hexamethylene diisocyanate:  
Distribution among environmental compartments : Koc: 1665 - 5861  
Stability in soil : No data available

**Other adverse effects**

Environmental fate and pathways : No data available

Results of PBT and vPvB assessment : No data available

Endocrine disrupting potential : No data available

Adsorbed organic bound halogens (AOX) : No data available

**Hazardous to the ozone layer**

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

Global warming potential (GWP) : No data available

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

**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.  
Dispose of as hazardous waste in compliance with local and national regulations.  
Dispose of contents/ container to an approved waste disposal plant.
- Contaminated packaging : Empty remaining contents.  
Dispose of as unused product.  
Do not re-use empty containers.

**SECTION 14. TRANSPORT INFORMATION****International Regulations****IATA**

Not regulated as dangerous goods

**IMDG**

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****DOT Classification**

Not regulated as dangerous goods

**SECTION 15. REGULATORY INFORMATION****EPCRA - Emergency Planning and Community Right-to-Know Act****CERCLA Reportable Quantity**

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
hexamethylene diisocyanate	822-06-0	100	33333

**SARA 311/312 Hazards** : Respiratory or skin sensitisation

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**ARALDITE® 2028-1 ISOCYANATE**

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	06/26/2018	400001015061	Date of first issue: 06/26/2018

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

**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:**

CH INV	: The formulation contains substances listed on the Swiss Inventory, On the inventory, or in compliance with the inventory
DSL	: All components of this product are on the Canadian DSL
AICS	: 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	: On the inventory, or in compliance with the inventory

**Inventories**

AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan), 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.



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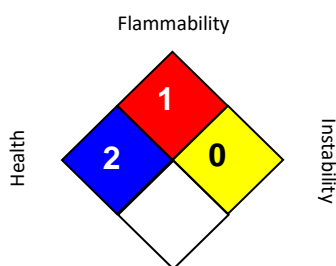
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**ARALDITE® 2028-1 ISOCYANATE**

Version 1.0      Revision Date: 06/26/2018      SDS Number: 400001015061      Date of last issue: -  
 Date of first issue: 06/26/2018

**SECTION 16. OTHER INFORMATION****Further information****NFPA 704:****HMIS® IV:**

<b>HEALTH</b>	*	<b>2</b>
<b>FLAMMABILITY</b>		<b>1</b>
<b>PHYSICAL HAZARD</b>		<b>0</b>

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.

Revision Date : 06/26/2018

ACGIH : USA. ACGIH Threshold Limit Values (TLV)  
 ACGIH / TWA : 8-hour, time-weighted average

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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.

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