# Material Safety Data Sheet

HUNTSMAN
Enriching lives through innovation

## ARALDITE® 2028 A US

## 1 . Product and company identification

**Product name** : **ARALDITE® 2028 A US**
**Material uses** : Isocyanate for adhesive systems
**MSDS #** : 00080702
**Validation date** : 6/8/2013.
**Supplier/Manufacturer** : Huntsman Advanced Materials Americas LLC
P.O. Box 4980
The Woodlands, TX 77387

Non-Emergency phone: (800) 257-5547

E-Mail: MSDS@huntsman.com

**In case of emergency** : Chemtrec: (800) 424-9300 or (703) 527-3887

## 2 . Hazards identification

**Physical state** : Liquid.
**Odor** : Slight
**Color** : Yellow.

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Emergency overview** : WARNING!

MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION.

Do not breathe vapor or mist. Do not get on skin or clothing. Avoid contact with eyes. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

**See toxicological information (Section 11)**

**GENERAL INFORMATION** : Read the entire MSDS for a more thorough evaluation of the hazards.

## 3 . Composition/information on ingredients

| Name | CAS number | % |
|---|---|---|
| hexamethylene-diisocyanate, homopolymer | 28182-81-2 | 60 - 100 |
| hexamethylene-di-isocyanate | 822-06-0 | 0.1 - 1 |

## 4 . First aid measures

**Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

**Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

**Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Notes to physician** : No specific treatment. Treat symptomatically. Call medical doctor or poison control center immediately if large quantities have been ingested.

## 5 . Fire-fighting measures

**Flash point** : Closed cup: 181°C (357.8°F)

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

**Extinguishing media**

**Suitable** : Use an extinguishing agent suitable for the surrounding fire.

**Not suitable** : None known.

**Special exposure hazards** : 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.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## 6 . Accidental release measures

**Personal precautions** : 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).

**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 for cleaning up** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

# 7 . Handling and storage

**Handling** : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. 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. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. 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 not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

**Storage** : Store between the following temperatures: 2 to 40°C (35.6 to 104°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

# 8 . Exposure controls/personal protection

**Consult local authorities for acceptable exposure limits.**

**Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

**Engineering measures** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

**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. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal protection**

**Respiratory** : In case of inadequate ventilation wear respiratory protection. 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.

**Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. > 8 hours (breakthrough time): butyl rubber, Ethyl Vinyl Alcohol Laminate (EVAL), nitrile rubber, neoprene, Polyvinyl Chloride (PVC)

**Eyes** : 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. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

## 8 . Exposure controls/personal protection

**Skin** : 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.

**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, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## 9 . Physical and chemical properties

**Appearance**

**Physical state** : Liquid.

**Color** : Yellow.

**Odor** : Slight

**pH** : Not available.

**Boiling/condensation point** : Not available.

**Melting/freezing point** : Not available.

**Flash point** : Closed cup: 181°C (357.8°F)

**Flammable limits** : Not available.

**Auto-ignition temperature** : 480°C (896°F)

**Vapor pressure** : <0.00001 kPa (<0.000075 mm Hg) [room temperature]

**Specific gravity** : 1.14

**Water solubility** : Insoluble

**Partition coefficient: n-octanol/water (log Kow)** : Not available.

**Viscosity** : Dynamic (room temperature): 10000 mPa·s (10000 cP)

**Density** : 1.14 g/cm³ [20°C (68°F)]

**Vapor density** : Not available.

**Evaporation rate (butyl acetate = 1)** : Not available.

## 10 . Stability and reactivity

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

**Conditions to avoid** : No specific data.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## 11 . Toxicological information

**Acute toxicity**

# 11 . Toxicological information

| Product/ingredient name | Test | Endpoint | Species | Result |
|---|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | - | LD50 Dermal | Rabbit | >5000 mg/kg |
| hexamethylene-di-isocyanate | OECD 403 Acute Inhalation Toxicity | LC50 Inhalation Vapor | Rat - Male, Female | 124 mg/m³ |
| | OECD 402 Acute Dermal Toxicity | LD50 Dermal | Rat - Male, Female | >7000 mg/kg |

**Irritation/Corrosion**

| Product/ingredient name | Test | Species | Result |
|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | - | Rabbit | Eyes - Mild irritant |
| | - | Rabbit | Skin - Mild irritant |
| hexamethylene-di-isocyanate | OECD 405 Acute Eye Irritation/ Corrosion | Rabbit | Eyes - Corrosive |
| | OECD 404 Acute Dermal Irritation/ Corrosion | Rabbit | Skin - Corrosive |

**Conclusion/ Summary**

**Skin** : hexamethylene-diisocyanate, homopolymer — Slightly irritating to the skin.

hexamethylene-di-isocyanate — Corrosive to the skin.

**Eyes** : hexamethylene-diisocyanate, homopolymer — Slightly irritating to the eyes.

hexamethylene-di-isocyanate — Corrosive to eyes.

**Respiratory** : hexamethylene-diisocyanate, homopolymer — No known significant effects or critical hazards.

hexamethylene-di-isocyanate — No known significant effects or critical hazards.

**Sensitizer**

| Product/ingredient name | Test | Route of exposure | Species | Result |
|---|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | OECD 406 Skin Sensitization | skin | Guinea pig | Sensitizing |
| | - | skin | Guinea pig | Not sensitizing |
| | - | Respiratory | Guinea pig | Not sensitizing |
| hexamethylene-di-isocyanate | OECD 406 Skin Sensitization | skin | Rabbit | Sensitizing |

**Mutagenicity**

# 11 . Toxicological information

| Product/ingredient name | Test | Result |
|---|---|---|
| hexamethylene-diisocyanate, homopolymer | Experiment: In vitro<br>Subject: Bacteria<br>Metabolic activation: +/- | Negative |
| hexamethylene-di-isocyanate | Experiment: In vitro<br>Subject: Bacteria<br>Metabolic activation: +/- | Negative |
| | Experiment: In vitro<br>Subject: Mammalian-Animal<br>Metabolic activation: +/- | Negative |
| | Experiment: In vivo<br>Subject: Mammalian-Animal | Negative |

## Carcinogenicity

| Product/ingredient name | Test | Species | Dose | Exposure | Result/Result type |
|---|---|---|---|---|---|
| hexamethylene-di-isocyanate | OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies | Rat - Male, Female | 0.164 ppm | 2 years; 6 hours per day | Negative - Inhalation - NOAEL |

## Reproductive toxicity

| Product/ingredient name | Test | Species | Maternal toxicity | Fertility | Developmental effects |
|---|---|---|---|---|---|
| hexamethylene-di-isocyanate | OECD 422 Combined Repeated Dose Toxicity Study with the Reproduction/ Developmental Toxicity Screening Test | Rat - Male, Female | Positive | - | - |

## Teratogenicity

| Product/ingredient name | Test | Species | Result/Result type |
|---|---|---|---|
| hexamethylene-di-isocyanate | OECD 414 Prenatal Developmental Toxicity Study | Rat - Male, Female | Negative - Inhalation |

## Potential acute health effects

**Inhalation** : May cause sensitization by inhalation.

**Ingestion** : No known significant effects or critical hazards.

**Skin contact** : Slightly irritating to the skin. May cause sensitization by skin contact.

**Eye contact** : Slightly irritating to the eyes.

## Potential chronic health effects

# 11 . Toxicological information

| Product/ingredient name | Test | Endpoint | Species | Result |
|---|---|---|---|---|
| hexamethylene-di-isocyanate | OECD 453 Combined Chronic Toxicity/ Carcinogenicity Studies | Chronic NOEC Inhalation Vapor | Rat - Male, Female | 0.005 ppm |

**General** : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

**Target organs** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

**Medical conditions aggravated by over-exposure**

Pre-existing respiratory and skin disorders may be aggravated by over-exposure to this product.

# 12 . Ecological information

**Environmental effects** : No known significant effects or critical hazards.

**Aquatic ecotoxicity**

| Product/ingredient name | Test | Endpoint | | Exposure | Species | Result | |
|---|---|---|---|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | - | Acute | EC50 | 72 hours | Algae | >1000 | mg/l |
| | - | Acute | EC50 | 3 hours | Bacteria | >1000 | mg/l |
| | - | Acute | IC0 | 48 hours | Daphnia | >100 | mg/l |
| | - | Acute | IC0 | 96 hours | Fish | >100 | mg/l |
| hexamethylene-di-isocyanate | EU EC C.3 Algal Inhibition Test | Acute | EC50 | 72 hours Static | Algae | 77.4 | mg/l |
| | OECD 209 Activated Sludge, Respiration Inhibition Test | Acute | EC50 | 3 hours Static | Bacteria | 842 | mg/l |
| | EU EC C.2 Acute Toxicity for Daphnia | Acute | IC0 | 48 hours Static | Daphnia | >89.1 | mg/l |
| | EU EC C.1 Acute Toxicity for Fish | Acute | LC50 | 96 hours Static | Fish | >82.8 | mg/l |

**Persistence and degradability**

| Product/ingredient name | Test | Period | Result |
|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | - | 28 days | 0 % |
| hexamethylene-di-isocyanate | OECD 301F Ready Biodegradability - Manometric Respirometry Test | 28 days | 48 % |

# 12 . Ecological information

| Product/ingredient name | Aquatic half-life | Photolysis | Biodegradability |
|---|---|---|---|
| hexamethylene-diisocyanate, homopolymer | - | - | Not readily |
| hexamethylene-di-isocyanate | - | - | Not readily |

**Bioaccumulative potential**

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| hexamethylene-di-isocyanate | - | 3.2 | low |

**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

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. 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. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. 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** : Not regulated.

**TDG** : Not regulated.

**IMDG** : Not regulated.

**IATA** : Not regulated.

| Regulatory information | UN number | Classes | PG* | Label | Additional information |
|---|---|---|---|---|---|
| DOT Classification | Not regulated. | - | - | | - |
| TDG Classification | Not regulated. | - | - | | - |
| IMDG Class | Not regulated. | - | - | | - |

# 14 . Transport information

| | | | | | |
|---|---|---|---|---|---|
| **IATA-DGR Class** | Not regulated. | - | - | | - |

PG* : Packing group

# 15 . Regulatory information

**United States**

**HCS Classification** : Sensitizing material

**U.S. Federal regulations**

**TSCA 8(b) inventory** : **United States inventory (TSCA 8b)**: 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

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** :

| Product name | CAS number | Concentration % |
|---|---|---|
| hexamethylene-di-isocyanate | 822-06-0 | 0.1 - 1 |

**Clean Air Act - Ozone Depleting Substances (ODS)** : This product does not contain nor is it manufactured with ozone depleting substances.

**SARA 313 Form R - Reporting requirements** :

| Product name | CAS number | Concentration % |
|---|---|---|
| hexamethylene-di-isocyanate | 822-06-0 | 0.1 - 1 |

**CERCLA Hazardous substances** : No ingredients listed.

**State regulations**

**PENNSYLVANIA - RTK** : No ingredients listed.

**California Prop 65** : This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**International regulations**

**Canada**

**WHMIS (Canada)** : Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

**CEPA DSL** : All components are listed or exempted.

**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.**

## 15 . Regulatory information

**International lists** : **Australia inventory (AICS)**: All components are listed or exempted.
**China inventory (IECSC)**: All components are listed or exempted.
**Japan inventory**: All components are listed or exempted.
**Korea inventory**: All components are listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: All components are listed or exempted.
**Philippines inventory (PICCS)**: All components are listed or exempted.
**Taiwan inventory (CSNN)**: Not determined.

## 16 . Other information

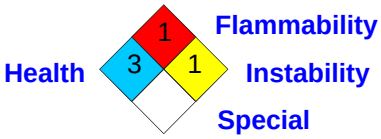
**Label requirements** : MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION.

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

| | |
|---|---|
| **Health** | 3 |
| **Flammability** | 1 |
| **Physical hazards** | 1 |
| **Personal protection** | |

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

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

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**Version** : 3

**Indicates information that has changed from previously issued version.**

**Notice to reader**

***While 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.***

***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.***

# 16 . Other information

***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.***

***NO PERSON OR ORGANIZATION EXCEPT A DULY AUTHORIZED HUNTSMAN EMPLOYEE IS AUTHORIZED TO PROVIDE OR MAKE AVAILABLE DATA SHEETS FOR HUNTSMAN PRODUCTS. DATA SHEETS FROM UNAUTHORIZED SOURCES MAY CONTAIN INFORMATION THAT IS NO LONGER CURRENT OR ACCURATE. NO PART OF THIS DATA SHEET MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM, OR BY ANY MEANS, WITHOUT PERMISSION IN WRITING FROM HUNTSMAN. ALL REQUESTS FOR PERMISSION TO REPRODUCE MATERIAL FROM THIS DATA SHEET SHOULD BE DIRECTED TO HUNTSMAN, MANAGER, PRODUCT SAFETY AT THE ABOVE ADDRESS.***

# Material Safety Data Sheet

HUNTSMAN
Enriching lives through innovation

## ARALDITE® 2028 B US

## 1 . Product and company identification

**Product name** : **ARALDITE® 2028 B US**
**Material uses** : Polyol for adhesive systems
**MSDS #** : 00079298
**Validation date** : 6/8/2013.
**Supplier/Manufacturer** : Huntsman Advanced Materials Americas LLC
P.O. Box 4980
The Woodlands, TX 77387

Non-Emergency phone: (800) 257-5547

E-Mail: MSDS@huntsman.com

**In case of emergency** : Chemtrec: (800) 424-9300 or (703) 527-3887

## 2 . Hazards identification

**Physical state** : Liquid.
**Odor** : Slight
**Color** :

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Emergency overview** : WARNING!

CAUSES EYE IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

Do not breathe vapor or mist. Do not get on skin or clothing. Avoid contact with eyes. Wash thoroughly after handling.

**See toxicological information (Section 11)**

**GENERAL INFORMATION** : Read the entire MSDS for a more thorough evaluation of the hazards.

## 3 . Composition/information on ingredients

| Name | CAS number | % |
|---|---|---|
| amine based tetrol | 102-60-3 | 7 - 13 |
| Propylene carbonate | 108-32-7 | 3 - 7 |
| 3-aminopropyltriethoxysilane | 919-30-2 | 1 - 3 |

## 4 . First aid measures

**Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

**Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

**Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Notes to physician** : No specific treatment. Treat symptomatically. Call medical doctor or poison control center immediately if large quantities have been ingested.

## 5 . Fire-fighting measures

**Flash point** : Closed cup: >100°C (>212°F) [DIN 51758 EN 22719 (Pensky-Martens Closed Cup)]

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
metal oxide/oxides

**Extinguishing media**

**Suitable** : Use an extinguishing agent suitable for the surrounding fire.

**Not suitable** : None known.

**Special exposure hazards** : 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.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## 6 . Accidental release measures

**Personal precautions** : 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).

**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 for cleaning up** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

# 7 . Handling and storage

**Handling** : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

**Storage** : Store between the following temperatures: 2 to 40°C (35.6 to 104°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

# 8 . Exposure controls/personal protection

**Consult local authorities for acceptable exposure limits.**

**Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

**Engineering measures** : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

**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. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal protection**

**Respiratory** : In case of inadequate ventilation wear respiratory protection. 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.

**Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. > 8 hours (breakthrough time): butyl rubber, Ethyl Vinyl Alcohol Laminate (EVAL)

**Eyes** : 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. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

**Skin** : 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.

## 8 . Exposure controls/personal protection

**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, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## 9 . Physical and chemical properties

**Appearance**

**Physical state** : Liquid.

**Color** :

**Odor** : Slight

**pH** : Not available.

**Boiling/condensation point** : Not available.

**Melting/freezing point** : Not available.

**Flash point** : Closed cup: >100°C (>212°F) [DIN 51758 EN 22719 (Pensky-Martens Closed Cup)]

**Flammable limits** : Not available.

**Auto-ignition temperature** : Not available.

**Decomposition temperature** : >200°C (>392°F)

**Vapor pressure** : Not available.

**Specific gravity** : Not available.

**Water solubility** : Insoluble

**Partition coefficient: n-octanol/water (log Kow)** : Not available.

**Viscosity** : Dynamic (room temperature): 1000 to 1500 mPa·s (1000 to 1500 cP)

**Density** : 1.12 g/cm³ [25°C (77°F)]

**Vapor density** : Not available.

**Evaporation rate (butyl acetate = 1)** : Not available.

## 10 . Stability and reactivity

**Chemical stability** : The product is stable.

Under normal conditions of storage and use, hazardous reactions will not occur.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

**Conditions to avoid** : No specific data.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## 11 . Toxicological information

**Acute toxicity**

# 11 . Toxicological information

| Product/ingredient name | Test | Endpoint | Species | Result |
|---|---|---|---|---|
| amine based tetrol | Unknown guidelines Not known | LD50 Oral | Rat | 3280 mg/kg |
| | OECD 401 Acute Oral Toxicity | LD50 Oral | Rat - Male, Female | >2000 mg/kg |
| 3-aminopropyltriethoxysilane | OECD 403 Acute Inhalation Toxicity | LC50 Inhalation Vapor | Rat - Male | >5 ppm |
| | EPA OPPTS EPA OTS 798.1100 | LD50 Dermal | Rabbit - Male, Female | 4.29 ml/kg |
| | EPA OPPTS EPA OTS 798.1175 | LD50 Oral | Rat - Male, Female | 1.57 to 2.83 ml/kg |
| Propylene carbonate | OECD 402 Acute Dermal Toxicity | LD50 Dermal | Rabbit - Male, Female | >2000 mg/kg |
| | No official guidelines | LD50 Oral | Rat - Male, Female | 33520 mg/kg |

**Irritation/Corrosion**

| Product/ingredient name | Test | Species | Result |
|---|---|---|---|
| amine based tetrol | OECD 404 Acute Dermal Irritation/ Corrosion | Rabbit | Skin - Non-irritant. |
| | OECD 405 Acute Eye Irritation/ Corrosion | Rabbit | Eyes - Irritant |
| 3-aminopropyltriethoxysilane | OECD 405 Acute Eye Irritation/ Corrosion | Rabbit | Eyes - Corrosive |
| | OECD 404 Acute Dermal Irritation/ Corrosion | Rabbit | Skin - Corrosive |
| Propylene carbonate | EPA OPPTS | Rabbit | Eyes - Moderate irritant |
| | OECD 404 Acute Dermal Irritation/ Corrosion | Rabbit | Skin - Non-irritant. |

**Conclusion/ Summary**

**Skin** :
- amine based tetrol — Slightly irritating to the skin.
- Propylene carbonate — Non-irritating to the skin.
- 3-aminopropyltriethoxysilane — Corrosive to the skin.

**Eyes** :
- amine based tetrol — Irritating to eyes.
- Propylene carbonate — Irritating to eyes.
- 3-aminopropyltriethoxysilane — Corrosive to eyes.

**Respiratory** :
- amine based tetrol — No known significant effects or critical hazards.
- Propylene carbonate — No known significant effects or critical hazards.
- 3-aminopropyltriethoxysilane — No known significant effects or critical hazards.

**Sensitizer**

| Product/ingredient name | Test | Route of exposure | Species | Result |
|---|---|---|---|---|
| amine based tetrol | Unknown guidelines Not known | skin | Not known | Not sensitizing |
| 3-aminopropyltriethoxysilane | OECD 406 Skin Sensitization | skin | Guinea pig | Sensitizing |
| Propylene carbonate | No official guidelines | skin | Human | Not sensitizing |

# 11 . Toxicological information

## Mutagenicity

| Product/ingredient name | Test | Result |
|---|---|---|
| amine based tetrol | Experiment: In vitro<br>Subject: Bacteria<br>Metabolic activation: +/- | Negative |
| | Experiment: In vitro<br>Subject: Mammalian-Animal<br>Metabolic activation: +/- | Negative |
| | Experiment: In vivo<br>Subject: Mammalian-Animal<br>Cell: Somatic | Negative |
| 3-aminopropyltriethoxysilane | Experiment: In vivo<br>Subject: Mammalian-Animal | Negative |
| Propylene carbonate | Experiment: In vitro<br>Subject: Mammalian-Animal | Negative |
| | Experiment: In vitro<br>Subject: bacteria/yeast<br>Metabolic activation: +/- | Negative |
| | Experiment: In vivo<br>Subject: Mammalian-Animal | Negative |

**Conclusion/ Summary** : Propylene carbonate — Not mutagenic in a standard battery of genetic toxicological tests.

## Carcinogenicity

| Product/ingredient name | Test | Species | Dose | Exposure | Result/Result type |
|---|---|---|---|---|---|
| amine based tetrol | - | Rat - Male | >1216 mg/kg | 102 weeks | Negative - Oral - NOAEL |
| Propylene carbonate | OECD 451 Carcinogenicity Studies | Mouse - Male | 1500 to 2000 mg/kg | 104 weeks; 2 days per week | Negative - Dermal - NOAEL |

## Reproductive toxicity

| Product/ingredient name | Test | Species | Maternal toxicity | Fertility | Developmental effects |
|---|---|---|---|---|---|
| amine based tetrol | OECD 421 Reproduction/ Developmental Toxicity Screening Test | Rat - Male, Female | Negative | Negative | Negative |
| Propylene carbonate | OECD 414 Prenatal Developmental Toxicity Study | Rat | Negative | Negative | Negative |

## Teratogenicity

| Product/ingredient name | Test | Species | Result/Result type |
|---|---|---|---|
| amine based tetrol | - | Rat - Female | Negative - Oral |
| Propylene carbonate | OECD 414 Prenatal Developmental Toxicity Study | Rat - Male, Female | Negative - Oral |

# 11 . Toxicological information

## Potential acute health effects

**Inhalation** : No known significant effects or critical hazards.

**Ingestion** : No known significant effects or critical hazards.

**Skin contact** : Slightly irritating to the skin. May cause sensitization by skin contact.

**Eye contact** : Irritating to eyes.

## Potential chronic health effects

| Product/ingredient name | Test | Endpoint | Species | Result |
|---|---|---|---|---|
| amine based tetrol | OECD 407 Repeated Dose 28-day Oral Toxicity Study in Rodents | Sub-acute NOAEL Oral | Rat - Male, Female | 1000 mg/kg |
| 3-aminopropyltriethoxysilane | OECD 408 Repeated Dose 90-Day Oral Toxicity Study in Rodents | Sub-chronic NOAEL Oral | Rat - Male, Female | 200 mg/kg |
| Propylene carbonate | OECD 408 Repeated Dose 90-Day Oral Toxicity Study in Rodents | Sub-chronic NOEL Oral | Rat - Male, Female | >5000 mg/kg |
| | OECD 413 Subchronic Inhalation Toxicity: 90-day Study | Sub-chronic NOEC Inhalation Dusts and mists | Rat - Male, Female | 100 mg/m³ |

**General** : Contains material that can cause target organ damage. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

**Target organs** : Contains material which causes damage to the following organs: kidneys, lungs, liver.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

**Medical conditions aggravated by over-exposure**

Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

# 12 . Ecological information

**Environmental effects** : No known significant effects or critical hazards.

**Aquatic ecotoxicity**

# 12 . Ecological information

| Product/ingredient name | Test | Endpoint | | Exposure | Species | Result | |
|---|---|---|---|---|---|---|---|
| Propylene carbonate | DIN DIN 38412 Part 8 | Acute | EC50 | 16 hours Static | Bacteria | 25619 | mg/l |
| | OECD 202 *Daphnia* sp. Acute Immobilisation Test | Acute | EC50 | 48 hours Static | Daphnia | >1000 | mg/l |
| | OECD 201 Alga, Growth Inhibition Test | Acute | ErC50 (growth rate) | 72 hours Static | Algae | >900 | mg/l |
| | EU EC C.1 Acute Toxicity for Fish | Acute | LC50 | 96 hours Semi-static | Fish | >1000 | mg/l |
| | OECD 201 Alga, Growth Inhibition Test | Chronic | NOEC | 72 hours Static | Algae | 900 | mg/l |
| | OECD 201 Alga, Growth Inhibition Test | Chronic | NOEC | 72 hours Static | Algae | 929 | mg/l |
| 3-aminopropyltriethoxysilane | EU EC C.3 Algal Inhibition Test | Acute | EC50 | 72 hours Static | Algae | >1000 | mg/l |
| | - | Acute | EC50 | 5.75 hours Static | Bacteria | 43 | mg/l |
| | OECD 202 *Daphnia* sp. Acute Immobilisation Test | Acute | EC50 | 48 hours Static | Daphnia | 331 | mg/l |
| | OECD 203 Fish, Acute Toxicity Test | Acute | LC50 | 96 hours Semi-static | Fish | >934 | mg/l |

## Persistence and degradability

| Product/ingredient name | Test | Period | Result |
|---|---|---|---|
| Propylene carbonate | OECD 301B Ready Biodegradability - $CO_2$ Evolution Test | 29 days | 83.5 to 87.7 % |
| 3-aminopropyltriethoxysilane | EU EC C.4-A Biodegradation: Determination of the "Ready" Biodegradability: Dissolved Organic Carbon (DOC) Die-Away Test | 28 days | 67 % |

| Product/ingredient name | Aquatic half-life | Photolysis | Biodegradability |
|---|---|---|---|
| Propylene carbonate | - | - | Readily |
| 3-aminopropyltriethoxysilane | - | - | Not readily |

## Bioaccumulative potential

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Propylene carbonate | -0.5 | - | low |
| 3-aminopropyltriethoxysilane | 1.7 | 3.4 | low |

**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

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. 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. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. 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** : Not regulated.

**TDG** : Not regulated.

**IMDG** : Not regulated.

**IATA** : Not regulated.

| Regulatory information | UN number | Classes | PG* | Label | Additional information |
|---|---|---|---|---|---|
| DOT Classification | Not regulated. | - | - | | - |
| TDG Classification | Not regulated. | - | - | | - |
| IMDG Class | Not regulated. | - | - | | - |
| IATA-DGR Class | Not regulated. | - | - | | - |

PG* : Packing group

## 15 . Regulatory information

**United States**

**HCS Classification** : Irritating material
Sensitizing material
Target organ effects

**U.S. Federal regulations**

**TSCA 8(b) inventory** : **United States inventory (TSCA 8b)**: 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.

## 15 . Regulatory information

**SARA 311/312** : Immediate (acute) health hazard
Delayed (chronic) health hazard

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : No ingredients listed.

**Clean Air Act - Ozone Depleting Substances (ODS)** : This product does not contain nor is it manufactured with ozone depleting substances.

**SARA 313** : No ingredients listed.

**CERCLA Hazardous substances** : No ingredients listed.

**State regulations**

**PENNSYLVANIA - RTK** : No ingredients listed.

**California Prop 65** : **WARNING:** This product contains less than 0.1% of a chemical known to the State of California to cause cancer.

| Ingredient name | Cancer | Reproductive |
|---|---|---|
| propylene oxide | Yes. | No. |

**International regulations**

**Canada**

**WHMIS (Canada)** : Class D-2B: Material causing other toxic effects (Toxic).

**CEPA DSL** : All components are listed or exempted.

**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.**

**International lists** : **Australia inventory (AICS)**: All components are listed or exempted.
**China inventory (IECSC)**: All components are listed or exempted.
**Japan inventory**: All components are listed or exempted.
**Korea inventory**: All components are listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: At least one component is not listed.
**Philippines inventory (PICCS)**: All components are listed or exempted.
**Taiwan inventory (CSNN)**: Not determined.

## 16 . Other information

**Label requirements** : CAUSES EYE IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

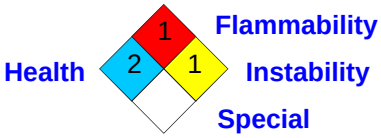
**Hazardous Material Information System (U.S.A.)** :

| | |
|---|---|
| **Health** | 2 |
| **Flammability** | 1 |
| **Physical hazards** | 1 |
| **Personal protection** | |

# 16 . Other information

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

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

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