Revision Date January 2011

# U11:
# PPI Stock General Purpose Polystyrene

**This resin is an easy flowing crystal polystyrene designed for injection molded closures, containers and other applications.**

**Product Properties**

| Typical Properties | Method | Value Unit |
|---|---|---|
| **Physical** | | |
| Melt Flow Rate (200°C-5kg) | **ISO 1133H** | **1.2-20 g/10 min** |
| Density – Specific Gravity | **ISO 1183** | **1.04-1.05 sp gr** |
| Molding shrinkage | | **0.4-0.8 %** |
| Water absorption | **ISO 62** | **<0.1** |
| **Mechanical** | | |
| Unnotched Charpy impact strength | **ISO 179/Ea** | **8** |
| Tensile strength at break | **ISO 527-2** | **43** |
| Elongation at break | **ISO 527-2** | **3** |
| Tensile modulus | **D-638** | **460000** |
| Flexural modulus | **D-790** | **490000** |
| Rockwell hardness | **ISO 2039-2** | **L 70** |
| **Electrical** | | |
| Dielectric strength | | **135 KV/mm** |
| Surface resistivity | **ISO IEC 93** | **>10 E+14 Ohms** |
| **Thermal** | | |
| Vicat softening point 10N (T° increase = 50°C/h) | **ISO 306A50** | **90 C** |
| Vicat softening point 10N (T° increase = 50°C/h) | **ISO 306B50** | **85 C** |
| HDT unannealed under 1.8 MPa | **ISO 75-2A** | **72 C** |
| HDT annealed under 1.8 MPa | **ISO 75-2A** | **81 C** |
| Coefficient of linear thermal expansion | | **9.0 E-5 cm/cm/C** |

Parkway Plastics sources resin from various vendors to maintain price stability. These vendors include distributors and material manufacturers such as Ashland, Plastic Solutions, Bamberger Polymers, Amco, M Holland, & Osterman Trading. In general we source FDA approved resins. To reduce our environmental footprint Parkway reintroduces low levels of factory generated regrind into our molding process. Parkway reserves the right to change our stock polypropylene resins from time to time without notice. We do attempt to reduce changes to our resin but factors will sometimes necessitate such changes.

**Product Information**

# STYRON® 666D

*North America*

## *Crystal Polystyrene*

### Product Characteristics
Medium heat resistance
Medium flow
Food Contact Compliant(1)
UL Classification 94 HB(2)
USP Class VI(3)

### Typical Applications
Medical
Packaging/disposables

| Properties (4) | English System | | International System | | ASTM Method |
|---|---|---|---|---|---|
| | Value | Units | Value | Units | |
| **Physical Properties** | | | | | |
| Melt Flow Index (200°C/5 Kg) | 8.0 | g/10 min | 8.0 | g/10 min | D-1238 |
| Specific Gravity | 1.04 | | 1.04 | | D-792 |
| Coefficient of Linear Thermal Expansion ($10^{-5}$) | 5 | in/in/°F | 9 | cm/cm/°C | D-696 |
| Rockwell Hardness – L scale | 107 | | 107 | | D-785 |
| Mold Shrinkage($10^{-3}$) | 4 to 7 | in./in. | 4 to 7 | cm/cm | D-955 |
| **Injection Molded Properties** | | | | | |
| **Mechanical Properties** | | | | | |
| Tensile Strength | 6300 | psi | 43 | MPa | D-638 |
| Tensile Rupture | 6300 | psi | 43 | MPa | D-638 |
| Elongation | 3 | % | 3 | % | D-638 |
| Tensile Modulus | 460000 | psi | 3172 | MPa | D-638 |
| Flexural Strength | 8800 | psi | 61 | MPa | D-790 |
| Flexural Modulus | 490000 | psi | 3478 | MPa | D-790 |
| Izod Impact @ 23°C | 0.4 | ft-lb/in | 21 | J/m | D-256 |
| **Thermal Properties** | | | | | |
| Heat Deflection Temperature | | | | | |
| @ 264 psi | 180 | °F | 82 | °C | D-648 |
| @ 66 psi | 192 | °F | 89 | °C | D-648 |
| Vicat Softening Temperature | 210 | °F | 99 | °C | D-1525 |

1. When used unmodified for the manufacture of food contact articles, this product will comply with Food Additive Regulation 21 CFR 177.1640 under the U.S. FDA's, Food, Drug, and Cosmetic Act. Such uses are subject to good manufacturing practices and any other limitations which are part of the statute or regulations. These should be consulted for complete details.
2. www.UL.com file E326906
3. Americas Styrenics will not knowingly sell or sample any product or service ("Product") into any commercial or developmental application that is intended for:
   permanent (Long term) contact with internal body fluids or internal body tissues. Long term is a use which exceeds 72 continuous hours;
   use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems and ventricular bypass assisted devices);
   use as a critical component in medical devices that support or sustain human life; or
   use in applications designed specifically to promote or interfere with human reproduction.

Additionally, all Products intended for use in pharmaceutical applications must pass the then current Pharmaceutical Liability Guidelines.
4. Typical Properties, not to be considered specification limits.



**For Additional Information Contact Us:**
**In the United States and Canada: 1-844-512-1212 or 1-832-616-7800**

## Typical Processing Conditions

## Injection Molding

**Typical Molding Machine Settings**

| Zone | International System | | | | English System | | | |
|---|---|---|---|---|---|---|---|---|
| Nozzle | 213 | - | 243 | ° C | 415 | - | 470 | ° F |
| Zone # 1 | 218 | - | 249 | ° C | 425 | - | 480 | ° F |
| Zone # 2 | 218 | - | 249 | ° C | 425 | - | 480 | ° F |
| Zone # 3 | 199 | - | 213 | ° C | 390 | - | 415 | ° F |
| Back Pressure | 2 | - | 12 | bar | 25 | - | 175 | psi |

**Mold Temperatures**

High mold temperatures produce higher surface gloss and minimize flow marks and weld lines. Orientation is also reduced, thereby improving the properties of the part. However, high mold temperatures can require longer cycles in order to set up the polymer. Low mold temperatures are used for faster cycles. The parts will lack gloss, have poorer weld lines and a higher level of molded-in stress. Recommended mold surface temperatures for polystyrene range from 60º to 150º F. Use the highest temperature possible where you can maintain the desired cycle time.

**Feed**

The feed control should be adjusted to equal the desired shot weight. A general rule of molding parts with a minimum amount of internal stress and free of sink marks is to adjust the feed to keep the plunger from bottoming out. The feed should be adjusted to give a cushion of about ¼ inches. A larger cushion should be used only if the material contains moisture, air and/or excessive volatile content that show up as silver or black streaks in the molded part.

**Fill Rate**

Fast fill rates generally provide better uniformity in part size and quality. Rapid fill rates are possible if gate sizes and locations are properly selected. Gates too small for a particular part thickness can cause problems when filled at rapid speeds. Use the fastest fill rate the mold design and part will tolerate understanding that not all applications can tolerate a fast fill rate. Heavy section parts require a slow fill to avoid flow and weld marks on the surface of the part.

**Screw Forward**

Screw forward time should be controlled to prevent the plastic from flowing into or back from the cavity. Screw forward time is a function of mold and material temperature, part thickness, gate and runner size. Decreasing screw forward time increases part shrinkage. Allowances must be made in the screw forward time and hold pressure to minimize shrinkage and sink marks. Excessive screw forward time can over-pack the runner system or sprue, causing sticking.

## Extrusion

**Typical Extruder Settings**

| Zone | International System | | | | English System | | | |
|---|---|---|---|---|---|---|---|---|
| Zone # 1 | 177 | - | 193 | ° C | 350 | - | 380 | ° F |
| Zone # 2 | 182 | - | 204 | ° C | 360 | - | 400 | ° F |
| Zone # 3 | 188 | - | 210 | ° C | 370 | - | 410 | ° F |
| Zone # 4 | 199 | - | 216 | ° C | 390 | - | 420 | ° F |
| Zone # 5 | 204 | - | 221 | ° C | 400 | - | 430 | ° F |
| Zone # 6 | 204 | - | 221 | ° C | 400 | - | 430 | ° F |
| Melt Pump, Adapter, Pipes, Screen Changer | 193 | - | 232 | ° C | 380 | - | 450 | ° F |
| Die | 199 | - | 232 | ° C | 390 | - | 450 | ° F |
| Polish Rolls | 66 | - | 104 | ° C | 150 | - | 220 | ° F |
| Melt Temperature | 193 | - | 232 | ° C | 380 | - | 450 | ° F |
| Head Pressure | 10 | - | 21 | MPa | 1500 | - | 3000 | psi |

**Extrusion Conditions**

A lower temperature value within the typical temperature range denotes usage of the material with a styrene butadiene block copolymer in impact-modified blends. A screw design with a mixing head and a compression ratio of roughly 4:1 or a static mixing device is recommended for proper dispersion when using colorants or other additives.
The extruder die should be set from 110-150% of the required sheet thickness. The first polish roll gap should be set roughly 95% of the finished sheet thickness while the second polish roll gap can be set greater than or equal to 100% of the sheet thickness depending on what surface needs to be imparted upon the sheet by the final roll.
For all polystyrene products except OPS, the sheet orientation should not exceed 30%. Brittleness and tear strength of the sheet, especially in the machine direction, is drastically deteriorated at orientation levels >30%. Recommended temperatures are typical ranges only.



**For Additional Information Contact Us:**
**In the United States and Canada: 1-844-512-1212 or 1-832-616-7800**

PolyOne

# STYRON™ 666D

## Americas Styrenics LLC - General Purpose Polystyrene

Thursday, July 03, 2014

### General Information

| General | | | |
|---|---|---|---|
| Material Status | • Commercial: Active | | |
| Regional Availability | • North America | | |
| Features | • Food Contact Acceptable | • Medium Flow | • Medium Heat Resistance |
| Uses | • Medical/Healthcare Applications | • Packaging | |
| Agency Ratings | • FDA 21 CFR 177.1640 | • USP Class VI | |
| UL File Number | • E326906 | | |
| Forms | • Pellets | | |
| Processing Method | • Extrusion | • Injection Molding | |

### ASTM & ISO Properties [1]

| Physical | Typical Value (English) | | Typical Value (SI) | | Test Method |
|---|---|---|---|---|---|
| Specific Gravity | 1.04 | | 1.04 | g/cm³ | ASTM D792 |
| Melt Mass-Flow Rate (MFR) (200°C/5.0 kg) | 8.0 | g/10 min | 8.0 | g/10 min | ASTM D1238 |
| Molding Shrinkage - Flow | 0.0040 to 0.0070 | in/in | 0.40 to 0.70 | % | ASTM D955 |
| **Mechanical** | **Typical Value (English)** | | **Typical Value (SI)** | | **Test Method** |
| Tensile Modulus (Injection Molded) | 460000 | psi | 3170 | MPa | ASTM D638 |
| Tensile Strength (Injection Molded) | 6240 | psi | 43.0 | MPa | ASTM D638 |
| Tensile Strength (Break, Injection Molded) | 6240 | psi | 43.0 | MPa | ASTM D638 |
| Tensile Elongation (Break, Injection Molded) | 3.0 | % | 3.0 | % | ASTM D638 |
| Flexural Modulus (Injection Molded) | 504000 | psi | 3480 | MPa | ASTM D790 |
| Flexural Strength (Injection Molded) | 8850 | psi | 61.0 | MPa | ASTM D790 |
| **Impact** | **Typical Value (English)** | | **Typical Value (SI)** | | **Test Method** |
| Notched Izod Impact | | | | | ASTM D256 |
| 73°F (23°C), Injection Molded | 0.39 | ft·lb/in | 21 | J/m | |
| **Hardness** | **Typical Value (English)** | | **Typical Value (SI)** | | **Test Method** |
| Rockwell Hardness (L-Scale) | 107 | | 107 | | ASTM D785 |
| **Thermal** | **Typical Value (English)** | | **Typical Value (SI)** | | **Test Method** |
| Deflection Temperature Under Load | | | | | ASTM D648 |
| 66 psi (0.45 MPa), Unannealed | 192 | °F | 89.0 | °C | |
| Deflection Temperature Under Load | | | | | ASTM D648 |
| 264 psi (1.8 MPa), Unannealed | 180 | °F | 82.0 | °C | |
| Vicat Softening Temperature | 210 | °F | 99.0 | °C | ASTM D1525 |
| CLTE - Flow | 0.000050 | in/in/°F | 0.000090 | cm/cm/°C | ASTM D696 |
| **Flammability** | **Typical Value (English)** | | **Typical Value (SI)** | | **Test Method** |
| Flame Rating | HB | | HB | | UL 94 |

### Processing Information

| Injection | Typical Value (English) | | Typical Value (SI) | |
|---|---|---|---|---|
| Rear Temperature | 424 to 480 | °F | 218 to 249 | °C |
| Middle Temperature | 424 to 480 | °F | 218 to 249 | °C |

# STYRON™ 666D

## Americas Styrenics LLC - General Purpose Polystyrene

| Injection | Typical Value (English) | | Typical Value (SI) | |
|---|---|---|---|---|
| Front Temperature | 390 to 415 | °F | 199 to 213 | °C |
| Nozzle Temperature | 415 to 469 | °F | 213 to 243 | °C |
| Mold Temperature | 60.0 to 150 | °F | 15.6 to 65.6 | °C |
| Injection Rate | Fast | | Fast | |
| Back Pressure | 29.0 to 174 | psi | 0.200 to 1.20 | MPa |
| Cushion | 0.250 | in | 6.35 | mm |

| Extrusion | Typical Value (English) | | Typical Value (SI) | |
|---|---|---|---|---|
| Cylinder Zone 1 Temp. | 351 to 379 | °F | 177 to 193 | °C |
| Cylinder Zone 2 Temp. | 360 to 399 | °F | 182 to 204 | °C |
| Cylinder Zone 3 Temp. | 370 to 410 | °F | 188 to 210 | °C |
| Cylinder Zone 4 Temp. | 390 to 421 | °F | 199 to 216 | °C |
| Cylinder Zone 5 Temp. | 399 to 430 | °F | 204 to 221 | °C |
| Adapter Temperature | 379 to 450 | °F | 193 to 232 | °C |
| Melt Temperature | 379 to 450 | °F | 193 to 232 | °C |
| Die Temperature | 390 to 450 | °F | 199 to 232 | °C |

**Extrusion Notes**

Zone 6 Temperature: 204 to 221°C
Melt Pump, Pipes, Screen Changer Temperature: 193 to 232°C
Polish Rolls Temperature: 66 to 104°C
Head Pressure: 10 to 21 MPa

### Notes

[1] Typical properties: these are not to be construed as specifications.

# Material Safety Data Sheet

**Americas Styrenics LLC**

**Product Name:** STYRON* 666D Clear Polystyrene

**Issue Date:** 01/22/2010
**Print Date:** 03 Feb 2011

Americas Styrenics LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

## 1. Product and Company Identification

**Product Name**
STYRON* 666D Clear Polystyrene

**COMPANY IDENTIFICATION**
Americas Styrenics LLC
Suite 1200
24 Waterway Avenue
The Woodlands, TX 77380
USA

Customer Information Number: 888-552-6789
PSCS@amstyrenics.com

**EMERGENCY TELEPHONE NUMBER**
**24-Hour Emergency Contact:** 800-424-9300
**Local Emergency Contact:** 989-636-4400

## 2. Hazards Identification

### Emergency Overview
**Color:** Clear
**Physical State:** Pellets or Granules
**Odor:** Odorless to mild
**Hazards of product:**

Slipping hazard.

### OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

### Potential Health Effects
**Eye Contact:** Solid or dust may cause irritation or corneal injury due to mechanical action. Elevated temperatures may generate vapor levels sufficient to cause eye irritation. Effects may include discomfort and redness.

**Skin Contact:** Prolonged contact is essentially nonirritating to skin. Mechanical injury only. Under normal processing conditions, material is heated to elevated temperatures; contact with the material may cause thermal burns.
**Skin Absorption:** No adverse effects anticipated by skin absorption.
**Inhalation:** Dust may cause irritation to upper respiratory tract (nose and throat). Vapors released during thermal processing may cause respiratory irritation.
**Ingestion:** Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. May cause choking if swallowed.

## 3. Composition Information

| Component | CAS # | Amount |
|---|---|---|
| Styrene, polymers | 9003-53-6 | >= 95.0 % |
| White mineral oil (petroleum) | 8042-47-5 | <= 5.0 % |

## 4. First-aid measures

**Eye Contact:** Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist. May cause injury due to mechanical action.
**Skin Contact:** Wash skin with plenty of water. Seek first aid or medical attention as needed. If molten material comes in contact with the skin, do not apply ice but cool under ice water or running stream of water. DO NOT attempt to remove the material from skin. Removal could result in severe tissue damage. Seek medical attention immediately. Safety shower should be located in immediate work area.
**Inhalation:** Move person to fresh air; if effects occur, consult a physician.
**Ingestion:** If swallowed, seek medical attention. May cause gastrointestinal blockage. Do not give laxatives. Do not induce vomiting unless directed to do so by medical personnel.
**Notes to Physician:** If burn is present, treat as any thermal burn, after decontamination. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.
**Emergency Personnel Protection:** First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

## 5. Fire Fighting Measures

**Extinguishing Media:** Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam.
**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Soak thoroughly with water to cool and prevent re-ignition. If material is molten, do not apply direct water stream. Use fine water spray or foam. Cool surroundings with water to localize fire zone. Hand held dry chemical or carbon dioxide extinguishers may be used for small fires.
**Special Protective Equipment for Firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
**Unusual Fire and Explosion Hazards:** Pneumatic conveying and other mechanical handling operations can generate combustible dust. To reduce the potential for dust explosions, do not permit dust to accumulate. Dense smoke is produced when product burns.

**Hazardous Combustion Products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon dioxide. Carbon monoxide.

## 6. Accidental Release Measures

**Steps to be Taken if Material is Released or Spilled:** Contain spilled material if possible. Sweep up. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.
**Personal Precautions:** Spilled material may cause a slipping hazard. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
**Environmental Precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

## 7. Handling and Storage

### Handling
**General Handling:** No smoking, open flames or sources of ignition in handling and storage area. Good housekeeping and controlling of dusts are necessary for safe handling of product. Avoid breathing process fumes. Use with adequate ventilation. When appropriate, unique handling information for containers can be found on the product label. Workers should be protected from the possibility of contact with molten resin. Do not get molten material in eyes, on skin or clothing. Keep away from heat, sparks and flame. Pneumatic conveying and other mechanical handling operations can generate combustible dust. To reduce the potential for dust explosions, electrically bond and ground equipment and do not permit dust to accumulate. Dust can be ignited by static discharge. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

### Storage
Store in a dry place. Store in accordance with good manufacturing practices.

## 8. Exposure Controls / Personal Protection

### Exposure Limits

Although some of the components of this product may have exposure guidelines, no exposure would be expected under normal handling conditions due to the physical state of the material.

### Personal Protection
**Eye/Face Protection:** Use safety glasses (with side shields). If there is a potential for exposure to particles which could cause eye discomfort, wear chemical goggles. If exposure causes eye discomfort, use a full-face respirator.
**Skin Protection:** No precautions other than clean body-covering clothing should be needed. When handling hot material, a safety shower should be located in the immediate work area.

> **Hand protection:** Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized. Use gloves to protect from mechanical injury. Selection of gloves will depend on the task. Use gloves with insulation for thermal protection, when needed.

**Respiratory Protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. Use an approved air-purifying respirator when vapors are generated at increased temperatures or when dust or mist is present. The following should be effective types of air-purifying respirators: When dust/mist are present use a/an Particulate filter. When combinations of vapors, acids, or dusts/mists are present use a/an Organic vapor cartridge with a particulate pre-filter.

**Ingestion:** Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

### Engineering Controls

**Ventilation:** Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

## 9. Physical and Chemical Properties

| | |
|---|---|
| **Physical State** | Pellets or Granules |
| **Color** | Clear |
| **Odor** | Odorless to mild |
| **Odor Threshold** | No test data available |
| **Flash Point - Closed Cup** | Not applicable |
| **Flammability (solid, gas)** | No |
| **Flammable Limits In Air** | **Lower**: Not applicable<br>**Upper**: Not applicable |
| **Autoignition Temperature** | No test data available |
| **Vapor Pressure** | Not applicable |
| **Boiling Point (760 mmHg)** | Not applicable. |
| **Vapor Density (air = 1)** | Not applicable |
| **Specific Gravity (H2O = 1)** | 1.04 - 1.06 *Estimated.* |
| **Freezing Point** | Not applicable |
| **Melting Point** | No test data available |
| **Solubility in water (by weight)** | Negligible |
| **pH** | Not applicable |
| **Decomposition Temperature** | No test data available |
| **Partition coefficient, n-octanol/water (log Pow)** | No data available for this product. |
| **Evaporation Rate (Butyl Acetate = 1)** | Not applicable to solids |
| **Kinematic Viscosity** | Not applicable |

## 10. Stability and Reactivity

### Stability/Instability

Stable under recommended storage conditions. See Storage, Section 7.
**Conditions to Avoid:** Avoid temperatures above 300 °C (572 °F). Exposure to elevated temperatures can cause product to decompose.

**Incompatible Materials:** None known.

### Hazardous Polymerization

Will not occur.

### Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials. Processing may release fumes and other decomposition products. At temperatures exceeding melt temperatures, polymer fragments can be released. Fumes can be irritating. Decomposition products can include and are not limited to: Combustible gases.

## 11. Toxicological Information

### Acute Toxicity

**Ingestion**

Single dose oral LD50 has not been determined.
Typical for this family of materials. Estimated. LD50, Rat > 5,000 mg/kg

**Skin Absorption**

The dermal LD50 has not been determined.
Typical for this family of materials. Estimated. LD50, Rabbit > 2,000 mg/kg

**Inhalation**

The LC50 has not been determined.

### Repeated Dose Toxicity

Additives are encapsulated in the product and are not expected to be released under normal processing conditions or foreseeable emergency.

### Chronic Toxicity and Carcinogenicity

As product. No relevant information found.

### Developmental Toxicity

As product. No relevant information found.

### Reproductive Toxicity

As product. No relevant information found.

### Genetic Toxicology

As product. No relevant information found.

## 12. Ecological Information

ENVIRONMENTAL FATE

### Movement & Partitioning

No bioconcentration of the polymeric component is expected because of its high molecular weight. In the terrestrial environment, material is expected to remain in the soil. In the aquatic environment, material will sink and remain in the sediment.

### Persistence and Degradability

This water-insoluble polymeric solid is expected to be inert in the environment. Surface photodegradation is expected with exposure to sunlight. No appreciable biodegradation is expected.

ECOTOXICITY

Not expected to be acutely toxic, but material in pellet or bead form may mechanically cause adverse effects if ingested by waterfowl or aquatic life.

## 13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device.

## 14. Transport Information

**DOT Non-Bulk**
NOT REGULATED

**DOT Bulk**
NOT REGULATED

**IMDG**
NOT REGULATED

**ICAO/IATA**
NOT REGULATED

*This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.*

## 15. Regulatory Information

**OSHA Hazard Communication Standard**
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312**

| | |
|---|---|
| **Immediate (Acute) Health Hazard** | No |
| **Delayed (Chronic) Health Hazard** | No |
| **Fire Hazard** | No |
| **Reactive Hazard** | No |
| **Sudden Release of Pressure Hazard** | No |

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313**
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:**
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

| Component | CAS # | Amount |
|---|---|---|
| White mineral oil (petroleum) | 8042-47-5 | <= 5.0 % |

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:**
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)**
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

| Component | CAS # | Amount |
|---|---|---|
| Ethylbenzene | 100-41-4 | <= 350.0 PPM |

However, please note that there is inadequate evidence of ethylbenzene causing cancer in humans. Ethylbenzene has not been classified as a carcinogen by the International Agency for Research on Cancer (IARC), US Environmental Protection Agency (EPA) or the National Toxicology Program (NTP).

In March 2008, the Office of Environmental Health Hazard Assessment's (OEHHA) Proposition 65 department proposed an NSRL of 54 µg/day (inhalation) for ethylbenzene. The objective of the above warning statement is to comply with the Prop 65 statute.

For guidance on Prop 65 labeling requirements for your products, please refer to the workbook published by the Plastics Packaging Council (PPC) available by calling the Customer Information number found on page 1 of this MSDS.

**US. Toxic Substances Control Act**
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
**CEPA - Domestic Substances List (DSL)**
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

## 16. Other Information

### Product Literature
Additional information on this product may be obtained by calling your sales or customer service contact.

### Recommended Uses and Restrictions
A polystyrene plastic - For industrial conversion as a raw material for manufacture of articles or goods. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

### Revision
Identification Number: 80502 / 1004 / Issue Date 01/22/2010 / Version: 5.1
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

### Legend

| | |
|---|---|
| N/A | Not available |
| W/W | Weight/Weight |
| OEL | Occupational Exposure Limit |
| STEL | Short Term Exposure Limit |
| TWA | Time Weighted Average |
| ACGIH | American Conference of Governmental Industrial Hygienists, Inc. |
| DOW IHG | Dow Industrial Hygiene Guideline |
| WEEL | Workplace Environmental Exposure Level |
| HAZ_DES | Hazard Designation |
| Action Level | A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded. |

*Americas Styrenics LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product*

*as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*

# Product Stewardship/Regulatory Summary for GPPS/HIPS

Americas Styrenics LLC has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employees, public health and our environment. The success of our Product Stewardship program rests with each and every individual involved with Americas Styrenics LLC products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## Product Overview

Americas Styrenics manufactures General Purpose Polystyrene (GPPS) and High Impact Polystyrene (HIPS) resins. These resins are available with various physical and mechanical properties and are formulated with additives to affect processability, color, or other characteristics. The resins are available as pellets or granules.

## Chemical Identity

**Common Name:** General Purpose Polystyrene (GPPS)
Also known as vinyl benzene, styrene polymer.
**CAS No**. 9003-53-6

**Common Name:** High Impact Polystyrene (HIPS
Also known as styrene 1,3-butadiene copolymer
**CAS No:** 9003-55-8

## Exposure Potential

### Industrial Worker exposure

Exposure can occur either in a resin manufacturing facility or in the various industrial or manufacturing facilities that use these resins. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. If there is a potential for exposure to dust particles that could cause eye discomfort, wear chemical goggles. Provide general and/or local exhaust ventilation to control airborne dust levels. No other precautions other than clean, body-covering clothing should be needed.

Long sleeves and thermal gloves are necessary in areas where molten polymer is present. If molten material comes in contact with the skin, apply cool water. Do not attempt to remove the material from the skin, but seek medical attention immediately.

### Consumer exposure

Americas Styrenics does not sell resins for direct consumer use, but it is used as a raw material to make many products used by consumers. All our prime grades are approved for food-contact applications.

## Environmental Exposure

Due to the relatively high molecular weight of GPPS/HIPS, bioconcentration (accumulation in the food chain) is not expected. In terrestrial environments, the material is expected to remain in the soil. In aquatic environments, the material is expected to sink and remain in the sediment or bound to dissolved organic materials.
GPPS/HIPS resins are expected to be inert in the environment. Surface photodegradation will occur with exposure to sunlight. No appreciable biodegradation is anticipated. These resins are not likely to be acutely toxic, but material in pellet form may cause adverse mechanical effects if ingested by waterfowl or aquatic life.

**Health Information**
There are few health concerns resulting from handling GPPS or HIPS. Dust or small pellets may cause eye irritation or corneal injury due to mechanical action. Handling these resins is unlikely to cause skin reaction or irritation. If molten resin comes in contact with the skin, thermal burns can occur.
There is a very low risk of toxicity if the product is swallowed; harmful effects are not anticipated from swallowing small amounts. However, choking or blockage of the digestive tract is possible if the product is swallowed. Based on available data, repeated exposures are not anticipated to cause significant adverse effects. Additives are encapsulated in the polymer and are not expected to be released under normal processing conditions.

**Stability Information**
GPPS/HIPS resins are thermally stable at typical use temperatures. However, exposure to elevated temperatures can cause the product to decompose. Under high-heat processing conditions, small amounts of irritating fumes can be released.
To reduce the potential for dust explosion, do not permit dust to accumulate. During a fire, smoke may contain the original material in addition to toxic and/or irritating combustion products of varying composition. In smoldering or flaming conditions, carbon monoxide and carbon dioxide are generated. Dense smoke is produced when the product burns.

The NFPA classification for our polystyrene resins is: 1,1,0 (health, flammability, reactivity).

**Shelf Life**
The shelf life of Americas Styrenics' polystyrene products is 2 years from the date of manufacture.
The shelf life of 2 years for Americas Styrenics polystyrene products is that for which Americas Styrenics LLC guarantees retention of properties as stated in the sales specification, provided the material is properly stored following good manufacturing practices. In general, polystyrene resins when stored properly, will retain a high level of mechanical properties after storage times of many years.
Shelf life or storage time is the time between manufacture at Americas Styrenics and actual processing at the customer location. Guidelines for good storage practice must be followed e.g. storage in a sheltered location, with good ventilation, no direct sunlight and undamaged, original packaging.

**NOTICE: The information presented above is not intended to be a substitute for Material Safety Data Sheets (MSDS). Americas Styrenics LLC strongly encourages and expects its customers to read and understand the product MSDSs prior to use of Americas Styrenics LLC products. We expect you to follow the precautions identified in the MSDS unless your use conditions necessitate other appropriate methods or actions. Americas Styrenics LLC personnel are available to answer your questions and to provide reasonable support if needed. Click here for a list of available MSDSs.**

## Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of polystyrene resins. These regulations may vary by city, state, country, or geographic region
A summary of the regulatory profile of our prime grade polystyrene resins is provided below.
Please note the following:

1. **The information provided below applies only to Americas Styrenics PRIME grade polystyrene resins.**
2. **The information presented in this document is not exhaustive. Additional Information may be found by consulting the relevant Safety Data Sheet (SDS), Technical Data Sheet or by contacting Customer Service.**

### US FDA Food Contact Status

When used unmodified and processed in accordance with good manufacturing practices for food contact applications, all prime grade GPPS and HIPS resins will comply with the U.S. Food and Drug Administration's food additive regulation at 21 CFR § 177.1640, under the Federal Food, Drug, and Cosmetic Act. These products may be used to produce articles or components of articles used in contact with food for all food types described in Table 1 and Conditions of Use C-H described in Table 2 of U.S. FDA's regulation at 21 CFR § 176.170(c).

The preceding statement refers to regulatory requirements only, not to the products' physical utility. The uses cited above are subject to good manufacturing practices and any limitations which are part of the regulations**. It is the responsibility of the article producer or food packager to determine that the article is suitable for its intended use. The regulations should be consulted for complete details.**

### Health Canada - Health Products and Food Branch (HPFB) Status

The GPPS and HIPS resins listed below have been submitted to Health Canada's Food Packaging Materials Section of the Health Products and Food Branch (HPFB) for evaluation and have been granted "No Objection" status for use in general food packaging applications.

- STYRON™ 668
- STYRON™ 695
- STYRON™ 675
- STYRON™ 685D
- STYRON™ 685P
- STYRON™ A-TECH™ 1170
- STYRON™ A-TECH™ 1115
- STYRON™ A-TECH™ 1260
- EB6400
- EC6600
- EB6755
- EA6740
- EA3400
- MC3650
- MC3700
- STYRON™ 421
- STYRON™ 404
- STYRON™ 478
- STYRON™ 484
- STYRON™ 487
- STYRON™ 487R
- STYRON™ 498
- STYRON™ 663
- STYRON™ 666D
- STYRON™ 678C
- STYRON™ 693
- EA3130
- PolyRenew™ PS 1625

The Food Packaging Materials Section advises that each application is considered to be different even if many of the application's parameters are identical to another application for which they have previously offered an opinion.

**Therefore, regardless of the above HPFB opinion, we recommend that you review the specifics of your application with HPFB and acquire the HPFB opinion in regard to your particular application.**

### Drug Master File (DMF)

The following resins currently have an associated Drug Master File on file at FDA.

- STYRON™ 685D
- STYRON™ 685DL
- STYRON™ 685P
- STYRON™ 665
- STYRON™ 675
- STYRON™ 695
- STYRON™ 693
- STYRON™ 610
- STYRON™ 666D
- STYRON™ 668
- EA6740
- EA3130
- EA3400
- MB3150
- MC3650
- MC3700
- STYRON™ 478
- STYRON™ 498
- STYRON™ 484
- STYRON™ 487R
- STYRON™ 421
- EB6400
- EC6600
- EA6740
- EB6755
- EC6600
- XU 36400.00

**Biocompatibility - USP Class VI Plastics certification**
The following products have been tested for compliance against the United States Pharmacopoeia <88> Biological Reactivity Tests *In Vivo* for Class VI Plastics and determined to be compliant with USP Class VI requirements.

- STYRON™ 685D
- STYRON™ 666D
- STYRON™ 478
- STYRON™ 484
- STYRON™ 414
- MC3650
- MC3700
- EB6755
- EA3130
- EA6740
- STYRON™ A-TECH™ 1115

**CONEG**
Cadmium, hexavalent chromium, lead, or mercury is not intentionally introduced as an element during the manufacture or distribution of our polystyrene resins. The sum of the concentration levels of these elements incidentally present is not expected to exceed 100 ppm. Our GPPS and HIPS resins are therefore CONEG compliant.

**RoHS Directive 2011/65/EU (RoHS 2)**
Polystyrene resins manufactured by Americas Styrenics are in compliance with the requirements of EU-Directive 2011/65/EU (RoHS 2).

**Animal Content/BSE/TSE**
Our Polystyrene resins are not intentionally formulated with raw materials of animal origin. These products are formulated with raw materials that are either synthetic or derived from plant sources.

**Allergen Content**
The majority of our resins are not intentionally formulated with raw materials that originate from peanuts, soybeans, milk, eggs, fish, shellfish, tree nuts and/or wheat or gluten.

**Ozone Depleting Substances**
Our Polystyrene resins are not manufactured with Class I or II substances as defined in Title VI of the Clean Air Act of 1990 under the final rule published in the Federal Register on February 11, 1993 (58 FR 8136).

**REACH SVHC Content**
Our Polystyrene resins are not intentionally formulated with any substance classified as a REACH SVHC.

**Underwriters Laboratories (UL)**
Many of our resins are UL listed. Click on the link below for a list of resins:
Americas Styrenics UL Listings

**Miscellaneous**
Polystyrene resins manufactured by Americas Styrenics are not intentionally formulated with the following regulated chemicals or substances of concern (not an exhaustive list):

- Formaldehyde
- Asbestos
- Melamine
- Bisphenol A or Bisphenol F
- Phthalates
- Cadmium & Cadmium Components
- Hexavalent Chromium Compounds
- Lead and Lead Components
- Mercury and Mercury Compounds
- Antimony and Antimony Compounds
- Arsenic and Arsenic Compounds
- Beryllium and Beryllium Compounds
- Bismuth and Bismuth Compounds
- Nickel
- Selenium and Selenium Compounds
- Polyvinyl Chloride (PVC) and PVC blends
- Brominated Organic compounds (PBB, PbDE, DecaBDE)
- Chlorinated Organic Compounds (PCB, PCN, PCT, SCCP)
- Tributyl Tin(TBT) & Triphenyl Tin(TPT)
- Tributyl Tin Oxide (TBTO)
- Latex or Natural Rubber
- Azocolorants and azodyes
- Radioactive Substances
- Perfluorooctane Sulfonate/Perfluorooctanoic Acid (PFOS, PFOA)

**Americas Styrenics Medical Application Policy**

Americas Styrenics will not knowingly sell or sample any product or service ("Product") into any commercial or developmental application that is intended for:

a. permanent (long term) contact with internal body fluids or internal body tissues. "Long term" is defined as a use which exceeds 72 continuous hours.
b. use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems and ventricular bypass assisted devices).
c. use as a critical component in medical devices that support or sustain human life.
d. use in applications designed specifically to promote or interfere with human reproduction.

**Contact Information**

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**Revision history**

The table below documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

| Date | Revised By | Changes |
|---|---|---|
| 3/5/2013 | Melissa Martinez | Updated HPFB, DMF, USP Biocompatibility, RoHS, and Miscellaneous sections. |
| 10/08/2013 | Melissa Martinez | Updated FDA conditions of use, C-H |
| 04/16/2014 | Melissa Martinez | Updated company logo, phone numbers, links, USP |

Polystyrene resins are generally considered to be RESISTANT to the following, although impact grades may be slightly less resistant than crystal grades:

Higher molecular weight alcohols e.g. butyl alcohol, n-amyl alcohol, n-octyl alcohol
Saturated fats and oils e.g. mineral oil, glycerine, soybean oil, petroleum jelly, Mazola™
Dilute aqueous solutions e.g. alcohol/ water mixtures (beer), sugar solutions (flavoring agents), honey, acids (tomato or carrot juice), detergents (for dishes, laundry), dilute ammonia (aq), Coca-Cola™, Pepsi-Cola™, ginger ale

This list does not represent all possible materials that may come in contact with polystyrene, but is meant as a guide to illustrate what should and should not be used with polystyrene resins. Testing of the exact formulation in direct contact with the polystyrene resin parts to evaluate suitability is highly recommended.

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# Chemical Resistance of Crystal and Impact Polystyrene
(PS302-1008)

TECHNICAL BULLETIN

## TECHNICAL BACKGROUND

When certain materials come into contact with polystyrene resins, they can affect the weight, strength, color, dimensions, flexibility, or surface appearance of the polystyrene part. These interactions can result in a wide variety of effects, but these effects can be broadly grouped into three categories. Chemical attack on the polymer chain, such as oxidation or depolymerization, can lead to a reduction in polymer properties. Absorption of materials such as solvents can result in physical changes due to softening, swelling, or dissolution of the polymer. Finally the visible effects of stress cracking can vary widely, ranging from whitening of the polystyrene due to microscopic cracks to complete part failure caused by extensive cracking. In addition to material composition; temperature, pressure, length of time, and concentration of exposure may also affect polymer stability.

## RECOMMENDATIONS

Polystyrene resins are generally NOT RECOMMENDED for direct contact with the following materials due to severe crazing, softening, or dissolution of the polystyrene:

Aromatic and aliphatic hydrocarbons, e.g. toluene, xylene, butane, gasoline, diesel oil, fuel oil, turpentine, kerosene
Halogenated compounds, e.g. carbon tetrachloride, chloroform, bromine liquid, bromoform, refrigerants
Oxygenated materials such as esters, ketones, ethers, anhydrides, aldehydes e.g. butyl acetate, acetone (nail polish remover), tetrahydrofuran, acetic anhydride, phenol, propylene oxide, acetaldehyde
Unsaturated oils e.g. citronella oil, lemon oil, anise seed oil, boiled linseed oil, almond oil, wintergreen oil
Concentrated mineral and organic acids, e.g. sulfuric, nitric, glacial acetic
Nitriles e.g. acrylonitrile, acetonitrile
Aromatic amines e.g. aniline

Polystyrenes are classed as MODERATELY RESISTANT when contact may cause some visual surface effects such as crazing or discoloration. Polystyrene resins are generally considered to be moderately resistant to the following:

Low molecular weight alcohols e.g. methanol, ethanol, allyl alcohol
Mono or lightly unsaturated fats and oils, e.g. castor oil, corn oil, cottonseed oil, cocoa butter, mayonnaise, olive oil, Crisco™
Aliphatic amine compounds e.g. ethylene diamine, triethylene tetramine
Concentrated aqueous acids e.g. 25-50% acetic acid, vinegar, grapefruit, orange or lemon juice, lactic acid, coffee
Bleach e.g. Clorox™
Milk

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# Chemical Compatibility Guide

**Interpretation of Chemical Resistance**

The Chemical Resistance Chart and Chemical Resistance Summary Chart that follow are general guidelines for Thermo Scientific Nalgene products only. Because so many factors can affect the chemical resistance of a given product, you should test under your own conditions. If any doubt exists about specific applications of Nalgene® products, please contact Technical Service, Thermo Fisher Scientific, Nalgene and Nunc products, 75 Panorama Creek Drive, Rochester, New York 14625-2385, or call (800) 625-4327, Fax (800) 625-4363. International customers, contact our International Department at +1 (585) 899-7198, Fax +1 (585) 899-7195. In Europe, contact Nalgene at +44 (0) 1432 263933, Fax +44 (0) 1432 376567.

**Additional Chemical Resistance Information**

This chemical resistance chart is to be used for all labware including containers up to 50L. For NALGENE centrifugeware please refer to those charts in this catalog.

For chemical resistance of PETG (polyethylene terephthalate copolyester), see below.

For Nalgene fluorinated containers, including fluorinated high-density polyethylene (FLPE) and fluorinated polypropylene (FLPP), see inside back cover.

**Effects of Chemicals on Plastics**

Chemicals can affect the strength, flexibility, surface appearance, color, dimensions or weight of plastics. The basic modes of interaction which cause these changes are: (1) chemical attack on the polymer chain, with resultant reduction in physical properties, including oxidation; reaction of functional groups in or on the chain, and depolymerization; (2) physical change, including absorption of solvents, resulting in softening and swelling of the plastic; permeation of solvent through the plastic,and dissolution in a solvent, and (3) stress-cracking from the interaction of a "stress-cracking agent" with molded-in or external stresses. Also see "Chemical Resistance Classification".

The reactive combination of compounds of two or more classes may cause a synergistic or undesirable chemical effect. Other factors affecting chemical resistance include temperature, pressure and internal or external stresses (e.g., centrifugation), length of exposure and
concentration of the chemical. As temperature increases, resistance to attack decreases.Mixing and/or dilution of certain chemicals in Nalgene labware can be potentially dangerous. The reactive combination of different chemicals or compounds of two or more classes may cause an undesirable chemical effect or result in an increased temperature which can affect chemical resistance (as temperature increases, resistance to attack decreases). Other factors affecting chemical resistance include pressure and internal or external stresses (e.g., centrifugation), length of exposure and concentration of the chemical.

**Environmental Stress-Cracking**

Environmental stress-cracking is the failure of a plastic material in the presence of certain types of chemicals. This failure is not a result of chemical attack. Simultaneous presence of three
factors causes stress-cracking: tensile strength, a stress-cracking agent and inherent
susceptibility of the plastic to stress-cracking.

Common stress-cracking agents are detergents, surface active chemicals, lubricants, oils, ultra-pure water and plating additives such as brighteners and wetting agents. Relatively small concentrations of stress-cracking agent may be sufficient to cause cracking.

**Mixing and/or dilution of certain chemicals may result in reactions that produce heat and can cause product failure. Pre-test your specific usage and always follow correct lab safety procedures.**

ATTENTION: Please be aware that, although several polymers may have excellent resistance to various flammable organic chemicals and solvents, OSHA H CFR 29 1910.106 for flammable and combustible materials, or other local regulations, may restrict the volumes of solvents which may legally be stored in an enclosed area.

**Caution**

Do not store strong oxidizing agents in plastic labware except that made of FEP or PFA. Prolonged exposure causes embrittlement and failure. While prolonged storage may not be intended at time of filling, a forgotten container will fail in time and result in leakage of contents. Do not place any plastic labware in a flame.

**Quickly and easily search our extensive chemical resistance database at: www.nalgenelabware.com**

First letter of each pair applies to conditions at 20°C; the second to those at 50°C. At 20°C->EG<-at 50°C.

## Resin Codes:

| | |
|---|---|
| ECTFE | Halar ECTFE* (ethylene-chlorotrifluoroethylene copolymer) |
| ETFE | Tefzel ETFE† (ethylene-tetrafluoroethylene) |
| FEP | Teflon FEP† (fluorinated ethylene propylene) |
| HDPE | high-density polyethylene |
| FLPE | fluorinated polyethylene |
| LDPE | low-density polyethylene |
| PC | polycarbonate |
| PEI | polyetherimide |
| PETG | polyethylene terephthalate copolymer |
| PFA | Teflon PFA† (polyfluoroalkoxy) |
| PMMA | polymethyl methacrylate (acrylic) |
| PMP | polymethylpentene |
| PP | polypropylene |
| PPCO†† | polypropylene copolymer |
| PS | polystyrene |
| PSF | polysulfone |
| PVC | polyvinyl chloride |
| PVDF | polyvinylidene fluoride |
| RESMER | RESMER manufacturing technology |
| SAN | styrene acrylonitrile |
| TFE | Teflon TFE† (tetrafluoroethylene) |
| TMX | Thermanox |
| PMX | Permanox |
| XLPE | cross-linked high-density polyethylene |

*Halar is a registered trademark of Solvay Solexis.
†Or equivalent. Teflon and Tefzel are registered trademarks of DuPont.
††PPCO has replaced polyallomer (PA) in all products.

| | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CHEMICAL** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** | **20°** | **50°** |
| 1,4-Dioxane, pure | G | F | G | G | N | N | G | F | F | N | - | - | E | E | E | E | E | E | E | F | E | F | N | N | N | N | N | N | N | N | N | N | E | E | F | N | N | N | N | N | - | - | F | N | N | N |
| 2,2,4-Trimethylpentane, pure | F | N | F | N | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | G | F | N | N | G | F | G | F | - | - | - | - | - | - | - | - | E | E |
| 2,4,6-Trinitrophenol, pure | N | N | N | N | N | N | N | N | E | E | - | - | E | E | E | E | E | E | G | F | G | F | N | N | N | N | N | N | N | N | G | F | N | N | G | F | - | - | E | E | - | - | G | N | G | N |
| 2-Methoxyethanol, pure | E | G | E | E | G | F | E | E | E | E | F | N | E | E | E | E | E | E | E | G | E | E | N | N | F | N | F | N | N | N | N | N | E | E | G | F | - | - | N | N | - | - | - | - | E | E |
| 2-Propanol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | E | F | N | N | E | F | E | E | E | E | E | E |
| Acetaldehyde, pure | G | N | G | F | G | N | G | N | G | N | - | - | E | E | E | E | E | E | G | F | E | E | N | N | N | N | N | N | N | N | N | N | G | F | G | G | N | N | N | N | N | N | N | N | N | N |
| Acetamide, saturated | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | E | E | G | G | E | E | - | - | E | E | E | - | E | E | G | N |
| Acetic Acid, 5% | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | E | E | E | E | E | E | E | E | G | E | F | E | G | E | E | E | G | E | E | E | E | E | F | E | E | E | E | E | E | E | E |

E - No damage after 30 days of constant exposure. G - Little or no damage after 30 days of constant exposure. F - Some effect after 7 days of constant exposure. N - Immediate damage may occur. Not recommended for continuous use.

| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° |
| Acetic Acid, 50% | G | F | E | G | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | G | E | E | G | F | E | N | F | N | E | E | G | G | E | G | G | G | N | N | E | F | G | F | E | E | E | E |
| Acetic Acid, Glacial | G | N | G | G | E | G | E | G | G | G | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | N | N | N | E | E | F | N | G | G | F | N | N | N | N | N | N | N | F | N | E | G |
| Acetic Anhydride, pure | N | N | F | F | G | F | G | F | E | G | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | N | N | N | N | N | N |
| Acetone, pure | G | N | N | N | F | N | N | N | E | E | N | N | E | E | E | E | E | E | E | G | G | N | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | F | N | N | N | N | N |
| Acetonitrile, pure | E | E | E | E | E | G | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | E | E | F | N | N | N | N | N | - | - | N | N | G | G |
| Acetophenone, pure | N | N | F | F | F | N | F | N | G | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | G | G | F | N | N | N | N | N | - | - | - | - | N | N |
| Acrylonitrile, pure | E | E | E | E | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | E | E | F | N | - | - | - | - | - | - | E | E | G | N |
| Adipic Acid, pure | E | G | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | G | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Alanine, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | - | - | E | G | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | N |
| Allyl Alcohol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | G | E | N | G | N | G | F | G | F | E | E | E | E | N | N | N | N | - | - | E | E | E | G |
| Aluminum Chloride, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | G | G | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E |
| Aluminum Hydroxide, pure | E | G | E | E | E | G | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | G | G | G | G | G | E | E | E | E | - | - | G | G | - | - | E | E | E | E |
| Aluminum Salts, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | G | E | E | E | G | E | E | E | E | - | - | E | G | - | - | E | E | E | E |
| Amino Acids, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | N |
| Ammonia, 25% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | N | G | F | E | G | E | G | F | F | E | G | E | - | E | G | G | F | E | E | N | N |
| Ammonia, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | E | G | F | G | F | E | G | F | F | E | G | E | - | E | G | G | N | E | E | N | N |
| Ammonium Acetate, saturated | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | G | E | E | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | - | - | E | E |
| Ammonium Chloride, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | G | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E |
| Ammonium Glycolate, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | F | G | G | E | E | E | E | E | E | - | - | E | E | - | - | - | - | E | E |
| Ammonium Hydroxide, 5% | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | G | G | G | E | F | F | F | E | G | E | - | E | E | E | G | E | E | E | E |
| Ammonium Hydroxide, 30% | E | G | E | E | E | G | E | G | E | G | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | E | G | F | G | G | G | F | F | F | E | G | E | - | E | G | G | N | E | E | E | E |
| Ammonium Oxalate, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Ammonium Salts, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | G | E | E | E | G | E | E | G | G | E | E | E | E | - | - | E | G | - | - | E | E | E | E |
| Amyl Alcohol, pure | E | E | E | E | E | F | E | E | G | F | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | N | G | N | E | E | G | F | E | E | E | E | N | N | E | N | E | E | E | E | E | E |
| Amyl Chloride, pure | N | N | F | N | N | N | N | N | F | F | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | G | F | F | N | - | - | N | N | - | - | N | N | E | E |
| Aniline, pure | E | G | G | F | E | G | G | F | G | F | - | - | E | E | E | E | E | E | G | N | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | E | E | F | N | E | F |
| Aqua Regia, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | N | N | N | N | - | - | G | N | N | N | N | N | G | N |
| Arsenic Acid, pure | G | F | E | E | E | E | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | G | G | - | - | E | E | E | E | E | E | - | - | - | - | E | E | - | - | E | E | E | E |
| Benzaldehyde, pure | E | G | G | N | E | G | E | G | E | F | - | - | E | E | E | E | E | E | E | F | E | F | N | N | N | N | N | N | F | N | N | N | G | N | F | N | N | N | N | N | F | N | N | N | F | N |
| Benzenamine, pure | E | G | G | F | E | G | G | F | G | F | - | - | E | E | E | E | E | E | G | N | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | - | - | F | N | E | F |
| Benzene, pure | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | F | N | N | N | E | E |
| Benzoic Acid, saturated | E | E | E | E | E | G | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | G | F | F | G | G | E | E | G | G | E | E | E | E | - | - | N | N | E | E |
| Benzol, pure | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | F | N | N | N | E | E |
| Benzyl Acetate, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | G | E | G | F | N | N | N | N | N | N | N | N | N | E | E | F | N | - | - | N | N | - | - | - | - | - | - |
| Benzyl Alcohol, pure | N | N | F | N | G | G | N | N | G | G | N | N | E | E | E | E | E | E | E | E | E | E | N | N | G | F | F | N | N | N | N | N | G | G | F | N | N | N | G | N | - | - | - | - | E | E |
| Boric Acid, pure | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | G | - | - | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Bromine, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | F | N | N | N | N | N | N | N | N | N | F | N | N | N | N | N | N | N | G | G | N | N | E | E |
| Bromobenzene, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | N | E | F | N | N | N | N | N | N | N | N | N | N | F | F | F | N | - | - | N | N | - | - | - | - | E | E |
| Bromoform, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | F | E | F | N | N | N | N | N | N | N | N | N | N | F | F | F | N | - | - | N | N | N | N | - | - | E | E |
| Butadiene, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | F | N | N | N | N | N | N | N | G | F | G | F | - | - | N | N | - | - | - | - | E | E |
| Butyl Acetate, pure | G | F | G | F | F | N | G | F | F | F | - | - | E | E | E | E | E | E | E | G | E | G | N | N | E | N | N | N | N | N | N | N | E | G | - | - | N | N | N | N | G | N | F | N | F | N |
| Butyl Chloride, pure | N | N | N | N | N | N | N | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | F | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | - | - | E | E |
| Butyric Acid, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | N | N | N | G | G | N | N | F | N | N | N | N | N | N | N | - | - | N | N | E | E |
| Calcium Chloride, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E |
| Calcium Hydroxide, concentrated | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | G | G | G | G | G | F | F | E | G | F | N | E | E | N | N | E | E | E | E |
| Calcium Hypochlorite, saturated | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | F | N | E | E | E | G | F | F | E | G | E | - | E | E | E | G | G | G | E | E |
| Carbazole, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | E | E | E | E | E | E | - | - | E | E | - | - | - | - | - | - |
| Carbon Disulfide, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | F | E | G | N | N | N | N | N | N | N | N | N | N | N | N | - | - | N | N | N | N | - | - | N | N | G | N |
| Carbon Tetrachloride, pure | F | N | G | F | G | F | N | N | N | N | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | N | N | N | N | N | N | N | E | G | F | N | N | N | F | N | E | - | N | N | E | E |

E - No damage after 30 days of constant exposure.

G - Little or no damage after 30 days of constant exposure.

F - Some effect after 7 days of constant exposure.

N - Immediate damage may occur. Not recommended for continuous use.

| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ |
| Caustic Potash, 30% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | E | G | N | E | G | G | G | F | F | E | G | E | - | E | E | G | F | E | E | E | G |
| Caustic Potash, 50% | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | F | E | G | F | F | E | G | E | N | E | G | G | F | E | E | N | N |
| Caustic Potash, concentrated | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | F | G | G | F | F | E | G | E | N | E | G | G | F | E | E | E | G |
| Caustic Soda, 1% | E | E | F | F | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | F | E | E | E | E | N | N | E | G | E | E | E | E | E | G | E | E | E | E |
| Caustic Soda, 50% | G | G | G | F | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | G | E | G | N | N | E | G | E | N | E | G | G | F | E | E | N | N |
| Caustic Soda, concentrated | G | G | G | F | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | G | E | G | N | N | E | G | E | N | E | G | G | F | E | E | N | N |
| Cedarwood Oil, pure | N | N | F | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | G | G | F | F | N | N | N | F | F | N | N | - | - | E | E | - | - | G | F | E | E | - | - | E | E |
| Cellosolve Acetate, pure | E | G | E | E | F | N | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | G | F | N | E | N | N | N | N | N | N | N | E | E | - | - | - | - | N | N | - | - | - | - | E | G |
| Chlorine, water solution | G | N | G | G | F | N | F | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | G | N | N | F | N | G | G | F | N | F | N | F | N | E | N | E | E | E | E |
| Chlorine, wet gas | G | N | G | F | F | N | F | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | G | F | N | N | F | N | N | N | N | N | G | F | - | - | F | N | N | N | F | N | F | N | E | E |
| Chlorine Wet Gas, 10% | G | N | G | F | F | N | F | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | G | F | N | N | F | N | N | N | N | N | G | F | - | - | F | N | G | G | G | F | G | F | E | E |
| Chlorine, Dry Gas, 10% | G | N | E | F | F | N | G | N | G | N | - | - | E | E | E | E | E | E | E | E | E | E | E | G | N | N | E | G | N | N | N | N | E | F | - | - | F | F | G | G | G | F | G | F | E | E |
| Chloroacetic Acid, pure | E | E | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | N | N | N | N | G | N | E | E | G | F | N | N | N | N | - | - | N | N | N | N |
| Chlorobenzene, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | F | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | N | N | E | E |
| Chloroform, pure | F | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | F | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | N | N | N | N | E | G |
| Chromic Acid, 10% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | G | E | N | E | G | E | G | E | E | E | G | F | N | E | G | E | G | E | E | E | E |
| Chromic Acid, 20% | E | E | E | E | G | G | G | F | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | N | N | G | N | N | N | G | G | E | E | G | G | N | N | E | G | F | N | E | E | E | E |
| Chromic Acid, 50% | E | E | E | E | G | F | G | F | G | G | - | - | E | E | E | E | E | E | E | E | E | E | F | N | N | N | G | N | N | N | F | N | E | E | F | N | N | N | E | G | N | N | E | G | E | G |
| Chromic Acid: Surfuric Acid Mixture, 96% | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | G | F | E | G |
| Cinnamon Oil, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | G | F | N | N | N | N | F | F | N | N | - | - | E | E | - | - | N | N | E | E | - | - | - | - |
| Citric Acid, 10% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E |
| Citric Acid, 1M | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E |
| Copper Sulfate, pure | E | E | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E |
| Cresol, pure | N | N | F | N | G | F | G | F | N | N | - | - | E | E | E | E | E | E | E | G | E | E | N | N | N | N | N | N | N | N | F | N | G | G | F | N | N | N | E | N | - | - | E | N | E | G |
| Cyclohexane, pure | F | N | F | N | G | N | F | N | N | N | G | N | E | E | E | E | E | E | E | G | E | E | E | F | N | N | N | N | N | N | N | N | G | F | G | F | G | - | F | N | E | E | N | N | E | E |
| Cyclohexanone, pure | N | N | F | N | F | N | F | N | G | F | N | N | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | - | - | N | N | G | N |
| Cyclopentane, pure | N | N | F | N | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | F | N | N | N | N | N | N | N | G | F | G | F | - | - | - | - | - | - | - | - | E | E |
| Decahydronaphthalene, pure | G | F | E | G | N | N | G | F | F | N | - | - | E | E | E | E | E | E | E | E | E | E | E | - | E | G | N | N | N | N | N | N | E | E | F | N | N | N | E | E | - | - | - | - | - | - |
| Decalin, pure | G | F | E | G | N | N | G | F | F | N | - | - | E | E | E | E | E | E | E | E | E | E | E | - | E | G | N | N | N | N | N | N | E | E | F | N | N | N | E | E | - | - | - | - | - | - |
| Diacetone, pure | N | N | N | N | G | F | G | F | F | F | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | - | - | - | - | N | N |
| Diacetone Alcohol, pure | F | N | E | E | G | F | E | F | E | E | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | E | F | E | E | E | G | N | N | N | N | - | - | - | - | F | N |
| Dibutyl Phthalate, pure | F | N | F | N | G | N | - | - | G | G | - | - | E | E | E | E | E | E | G | N | E | G | G | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | G | F | F | F | N | N |
| Diethyl Benzene, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | E | F | N | N | N | N | N | N | N | N | N | G | F | F | N | - | - | - | - | - | - | - | - | E | E |
| Diethyl Ether, pure | N | N | F | N | F | N | N | N | N | N | E | - | E | E | E | E | E | E | E | G | E | E | N | N | E | N | N | N | N | N | N | N | G | F | - | - | N | N | N | N | E | - | N | N | E | G |
| Diethyl Ketone, pure | N | N | N | N | G | G | G | G | G | F | - | - | E | E | E | E | E | E | G | F | G | F | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | - | - | F | N | N | N |
| Diethyl Malonate, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | F | N | G | N | N | N | F | F | N | N | E | E | - | - | - | - | N | N | - | - | - | - | N | N |
| Diethylamine, pure | N | N | F | N | G | N | G | N | F | F | - | - | E | E | E | E | E | E | E | N | E | G | N | N | N | N | N | N | G | F | G | G | N | N | E | G | - | - | - | - | E | - | - | - | G | N |
| Diethylene Dioxide, pure | G | F | G | G | N | N | G | F | F | N | - | - | E | E | E | E | E | E | E | F | E | F | N | N | N | N | N | N | N | N | N | N | E | E | F | N | N | N | N | N | - | - | F | N | N | N |
| Diethylene Glycol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | F | N | F | N | G | G | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E |
| Diethylene Glycol Monoethyl Ether, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | N | N | N | F | F | N | N | E | E | - | - | - | - | - | - | - | - | - | - | N | N |
| Dimethyl Acetamide, pure | F | N | E | E | E | E | E | E | F | G | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | G | - | - | - | - | - | - | E | - | - | - | N | N |
| Dimethyl Formamide, pure | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | G | G | G | G | N | N | N | N | N | N | N | N | N | N | G | G | - | - | N | N | N | N | E | N | - | - | N | N |
| Dimethylsulfoxide, pure | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | E | G | E | E | E | E | - | - | - | - | - | - | - | - | N | N |
| Dioxane, pure | G | F | G | G | N | N | G | F | F | N | - | - | E | E | E | E | E | E | E | F | E | F | N | N | N | N | N | N | N | N | N | N | E | E | F | N | N | N | N | N | - | - | F | N | N | N |
| Dipropylene Glycol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | G | E | G | F | N | G | F | F | N | G | G | E | E | E | E | E | E | - | - | E | E | E | E | E | E | N | N |
| DMSO, pure | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | E | G | E | E | E | E | - | - | - | - | - | - | - | - | N | N |
| Ethanol, 40% | E | G | E | E | E | E | E | E | E | G | G | - | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | G | E | G | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E |

E - No damage after 30 days of constant exposure. G - Little or no damage after 30 days of constant exposure. F - Some effect after 7 days of constant exposure. N - Immediate damage may occur. Not recommended for continuous use.

| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° |
| Ether, pure | N | N | F | N | N | N | N | N | F | N | E | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | F | - | - | - | - | N | N | E | - | N | N | G | N |
| Ethyl Acetate, pure | E | E | E | E | G | N | G | F | F | N | N | N | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | E | E | - | - | N | N | N | N | G | N | F | N | N | N |
| Ethyl Alcohol, 40% | E | G | E | E | E | E | E | E | E | G | F | N | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | G | E | G | E | E | E | E | N | N | E | E | E | E | E | E | E | E |
| Ethyl Alcohol, 96% | E | G | E | G | E | E | E | E | E | G | F | N | E | E | E | E | E | E | E | E | E | E | E | G | E | E | F | N | E | G | E | G | E | E | E | E | N | N | N | N | E | G | E | E | E | E |
| Ethyl Alcohol, pure | E | G | E | E | E | E | E | G | E | G | F | N | E | E | E | E | E | E | E | E | E | E | E | G | E | E | F | N | E | G | E | G | E | E | E | E | N | N | N | N | E | G | E | E | E | E |
| Ethyl Benzene, pure | N | N | F | N | N | N | N | N | N | N | E | - | E | E | E | E | E | E | G | F | G | F | N | N | N | N | N | N | N | N | N | N | G | F | F | N | - | - | N | N | - | - | N | N | G | N |
| Ethyl Benzoate, pure | F | F | G | G | G | F | G | F | G | F | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | E | E | F | N | - | - | N | N | - | - | - | - | N | N |
| Ethyl Butyrate, pure | G | N | G | F | G | N | G | N | F | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | E | G | - | - | N | N | N | N | - | - | - | - | N | N |
| Ethyl Chloride, pure | F | N | N | N | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | N | N | N | N | E | E |
| Ethyl Cyanoacetate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | F | N | N | N | F | F | G | N | E | E | - | - | - | - | N | N | - | - | - | - | N | N |
| Ethyl Lactate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | F | N | N | N | F | F | F | N | E | E | - | - | - | - | N | N | - | - | - | - | N | N |
| Ethylene Chloride, pure | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | N | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | F | N | N | N | E | E |
| Ethylene Glycol, pure | E | G | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | F | N | E | E | E | E | E | E | E | E | G | F | E | E | E | G | E | E | E | E |
| Ethylene Glycol | E | G | E | E | G | F | E | E | E | E | F | N | E | E | E | E | E | E | E | G | E | E | N | N | F | N | F | N | N | N | N | N | E | E | - | - | - | - | N | N | - | - | - | - | E | E |
| Monomethyl Ether, pure | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylene Oxide, 100% | F | F | G | F | F | N | F | F | F | N | G | F | E | E | E | E | E | E | E | E | E | E | F | N | N | N | G | N | E | E | N | N | E | G | F | N | E | E | F | F | - | - | N | N | E | E |
| Ethylene Oxide, gas | G | G | E | E | E | E | G | G | G | G | G | F | E | E | E | E | E | E | E | E | E | E | E | E | G | G | E | G | E | E | E | G | E | E | F | N | E | E | F | F | - | - | E | E | E | E |
| Ethylene Oxide, pure | F | F | G | F | F | N | F | F | F | N | G | F | E | E | E | E | E | E | E | E | E | E | F | N | N | N | G | N | E | E | N | N | E | G | F | N | F | N | N | N | - | - | N | N | E | E |
| EtO, gas | G | G | E | E | E | E | G | G | G | G | G | F | E | E | E | E | E | E | E | E | E | E | E | E | G | G | E | G | E | E | E | G | E | E | F | N | E | E | F | F | - | - | E | E | E | E |
| EtO, pure | F | F | G | F | F | N | F | F | F | N | G | F | E | E | E | E | E | E | E | E | E | E | F | N | N | N | G | N | E | E | N | N | E | G | F | N | F | N | N | N | - | - | N | N | E | E |
| Fatty Acids - saturated, pure | G | F | E | E | E | G | E | G | E | G | G | F | E | E | E | E | E | E | E | G | E | E | G | F | E | E | E | G | G | G | E | F | E | E | E | E | - | - | - | - | E | E | E | E | E | E |
| Fatty Acids - unsaturated, pure | G | F | E | E | E | G | E | G | E | G | G | F | E | E | E | E | E | E | E | G | E | E | G | F | E | E | E | G | G | G | E | F | E | E | E | E | - | - | - | - | E | E | E | E | E | E |
| Fluorides | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | G | E | E | E | E | - | - | - | - | - | - | - | - | E | E |
| Fluorine, gas | F | N | G | N | N | N | F | N | F | N | - | - | E | G | E | G | E | G | E | F | G | N | G | F | E | N | F | N | N | N | N | N | G | N | - | - | - | - | N | N | F | N | N | N | G | N |
| Formaldehyde, 10% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | G | E | E | G | G | E | G | E | G | E | G | G | N | E | E |
| Formaldehyde, 40% | E | G | E | G | E | E | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | N | G | F | G | G | E | G | G | G | E | F | F | N | F | N | G | N | E | E |
| Formalin, 10% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | G | G | E | E | G | G | E | G | E | G | E | G | G | N | E | E |
| Formalin, 40% | E | G | E | G | E | E | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | N | G | F | G | G | E | G | G | G | E | F | F | N | F | N | G | N | E | E |
| Formic Acid, 3% | E | G | E | E | E | E | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | N | E | G | E | G | E | E | E | E | E | E | E | - | E | G | E | E | E | E | E | E |
| Formic Acid, 50% | G | G | E | E | E | G | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | N | G | F | G | F | G | F | E | E | E | G | - | - | E | G | G | F | E | E | E | E |
| Formic Acid, 85% | G | G | E | E | E | G | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | N | F | N | G | F | G | F | E | E | E | G | - | - | G | F | G | F | E | E | E | E |
| Formic Acid, 100% | G | G | E | E | E | G | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | N | N | N | G | F | G | F | E | E | E | G | N | N | N | N | G | F | E | E | E | E |
| Formic Acid, pure | G | G | E | E | E | G | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | N | N | N | F | F | G | F | E | E | E | G | N | N | N | N | G | F | E | E | E | E |
| Freon TF, pure | E | G | E | G | E | G | E | G | F | N | - | - | E | E | E | E | E | E | E | G | E | G | G | N | G | F | N | N | G | F | F | N | E | E | F | N | - | - | F | N | E | - | - | - | E | E |
| Fuel Oil | F | N | G | F | E | F | E | G | G | F | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | N | N | E | G | F | N | E | G | G | F | - | - | E | G | E | - | G | N | E | E |
| Gasoline | N | N | F | N | F | N | N | N | G | F | G | - | E | E | E | E | E | E | E | E | E | E | F | N | G | N | N | N | F | F | N | N | G | F | F | N | N | N | F | N | G | G | G | N | E | E |
| Glutaraldehyde, pure | E | G | E | E | E | E | E | E | F | F | G | - | E | E | E | E | E | E | E | G | E | G | E | F | E | E | F | N | G | G | E | F | E | E | G | G | G | - | - | - | E | E | - | - | E | E |
| Glutaraldehyde Disinfectant | E | G | E | E | E | E | E | E | F | F | - | - | E | E | E | E | E | E | E | G | E | G | E | F | E | E | F | N | G | G | E | F | E | E | E | G | G | F | - | - | E | E | - | - | E | E |
| Glycerine, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | E | E | E | E | E | E | E | E | E | - | E | E | E | G | E | E | E | E |
| Glycerol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | E | E | E | E | E | E | E | E | E | - | E | E | E | G | E | E | E | E |
| Hexane, pure | N | N | G | F | G | F | F | N | F | N | G | - | E | E | E | E | E | E | E | G | E | E | F | N | E | N | N | N | E | G | N | N | E | G | G | F | E | - | E | E | E | F | G | N | E | E |
| Hydrazine, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | F | G | N | N | N | N | N | N | N | N | N | N | N | - | - | - | - | - | - | - | - | - | - | E | N | E | E |
| Hydrobromic Acid, 69% | E | E | E | G | E | G | - | - | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | N | E | G | F | F | E | G | - | - | N | N | G | G | G | F | E | E | E | E |
| Hydrochloric Acid, 5% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E |
| Hydrochloric Acid, 20% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | F | E | E | E | E | E | E | E | E | G | - | E | E | E | G | E | E | E | E |
| Hydrochloric Acid, 35% | E | E | E | E | E | G | E | G | E | G | G | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | F | N | E | E | E | E | E | E | E | E | N | N | E | G | G | F | E | E | E | E |
| Hydrofluoric Acid, 4% | E | E | E | E | E | E | E | G | E | E | F | N | E | E | E | E | E | E | E | E | E | E | G | G | E | E | G | F | G | F | G | F | E | E | G | F | - | - | G | F | E | E | E | E | E | E |
| Hydrofluoric Acid, 48% | E | E | E | E | E | G | E | E | E | G | N | N | E | E | E | E | E | E | E | E | E | E | F | N | G | F | F | N | F | N | N | N | E | E | N | N | N | N | E | G | G | F | E | E | E | E |
| Hydrogen Peroxide, 3% | E | E | E | E | E | G | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | G | E | G | E | E | E | G | E | - | E | E | G | F | E | E | E | E |

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| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ | 20˚ | 50˚ |
| Hydrogen Peroxide, 30% | E | G | E | E | E | F | E | G | E | G | G | - | E | E | E | E | E | E | E | E | E | E | E | E | E | G | G | N | E | E | E | G | E | E | E | G | F | N | E | E | N | N | E | E | E | E |
| Hydrogen Peroxide, 90% | E | N | E | E | E | F | E | G | E | G | G | - | E | E | E | E | E | E | E | E | E | F | E | E | E | G | N | N | E | E | E | G | E | E | E | G | N | N | E | E | N | N | F | F | G | N |
| Iodine Crystals, pure | N | N | N | N | E | E | F | N | G | N | - | - | E | E | E | E | E | E | E | E | E | G | G | N | N | N | N | N | N | N | G | F | N | N | E | G | - | - | N | N | F | N | N | N | E | E |
| Isobutanol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | F | G | N | E | G | G | G | E | E | E | E | N | N | G | N | - | - | E | E | E | E |
| iso-Butyl Alcohol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | F | G | N | E | G | G | G | E | E | E | E | N | N | G | N | - | - | E | E | E | E |
| Isopropanol, 100% | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | N | N | E | F | E | E | E | E | E | E |
| Isopropanol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | N | N | E | F | E | E | E | E | E | E |
| iso-Propanol, 100% | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | N | N | E | F | E | E | E | E | E | E |
| Isopropyl Acetate, pure | G | F | E | G | G | F | G | F | G | F | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | E | E | - | - | - | - | N | N | G | F | - | - | G | N |
| Isopropyl Alcohol, 100% | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | N | N | E | F | E | E | E | E | E | E |
| Isopropyl Alcohol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | G | F | E | G | E | E | E | E | N | N | E | F | E | E | E | E | E | E |
| Isopropyl Benzene, pure | F | N | F | N | F | N | F | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | - | - | N | N | - | - | - | - | - | - |
| Isopropyl Ether, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | F | - | - | - | - | - | - | - | - | - | - | E | G |
| Jet Fuel | F | N | F | N | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | G | N | E | G | N | N | G | F | G | F | G | F | G | F | - | - | - | - | E | - | - | - | E | E |
| Kerosene | F | N | F | N | F | N | N | N | G | F | G | - | E | E | E | E | E | E | E | E | G | F | E | - | E | E | N | N | G | F | N | N | G | F | G | F | E | F | - | - | G | F | F | N | E | E |
| Lacquer Thinner | N | N | F | N | F | N | F | N | F | F | N | N | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | G | F | G | F | N | N | - | - | - | - | - | - | E | E |
| Lactic Acid, 3% | E | G | E | E | E | E | E | G | E | G | F | N | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G |
| Lactic Acid, 85% | E | G | E | E | E | G | E | G | E | G | N | N | E | E | E | E | E | E | E | E | E | E | E | G | E | F | G | F | E | E | E | E | E | E | E | E | E | E | E | E | G | G | E | E | E | G |
| Lead Acetate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Magnesium Chloride, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E |
| MEK, pure | N | N | N | N | E | G | E | G | F | N | G | - | E | E | E | E | E | E | G | F | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | G | N | N | N | N | N |
| Mercuric Chloride, pure | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | E | E | E | E | N | N | - | - | G | G | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Methanol, 100% | E | G | E | E | E | E | E | E | E | G | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | F | N | E | G | G | F | E | E | E | G | N | N | N | N | E | G | E | E | E | E |
| Methoxyethyl Oleate, pure | E | G | E | E | E | G | E | G | E | G | G | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | N | N | N | N | N | N | E | E | - | - | - | - | - | - | - | - | - | - | - | - |
| Methyl Acetate, pure | F | N | F | F | G | F | G | F | E | E | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | G | - | - | - | - | - | - | G | F | - | - | E | N |
| Methyl Alcohol, 100% | E | G | E | E | E | E | E | E | E | G | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | F | N | E | G | G | F | E | E | E | G | N | N | N | N | E | G | E | E | E | E |
| Methyl Alcohol, pure | E | G | E | E | E | E | E | E | E | G | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | F | N | E | G | G | F | E | E | E | G | N | N | N | N | E | G | E | E | E | E |
| Methyl Ethyl Ketone, pure | N | N | N | N | E | G | E | G | F | N | G | - | E | E | E | E | E | E | G | F | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | G | N | N | N | N | N |
| Methyl Isobutyl Ketone, pure | N | N | N | N | G | F | G | F | F | F | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | - | - | N | N |
| Methyl Propyl Ketone, pure | N | N | F | N | G | F | G | F | F | F | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | - | - | N | N | - | - | - | - | N | N |
| Methylene Chloride, pure | N | N | F | N | F | N | F | N | F | N | N | N | E | E | E | E | E | E | F | N | G | N | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | N | N | N | N | E | G |
| Methyl-t-Butyl Ether, pure | N | N | F | N | F | N | F | N | E | E | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | G | F | - | - | - | - | - | - | - | - | - | - | E | E |
| MIBK, pure | N | N | N | N | G | F | G | F | F | F | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | - | - | N | N |
| Mineral Oil | G | N | E | E | E | F | E | E | E | G | G | N | E | E | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | G | G | N | E | E |
| Mineral Spirits | F | N | F | N | F | N | F | N | E | E | G | - | E | E | E | E | E | E | E | G | E | G | F | F | G | N | N | N | F | N | F | F | G | F | G | F | - | - | - | - | G | F | - | - | E | E |
| n-Amyl Acetate, pure | G | F | E | G | G | F | G | F | G | F | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | E | E | - | - | N | N | N | N | G | F | - | - | E | G |
| n-Butanol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | G | F | F | N | G | F | E | G | E | E | E | E | N | N | E | N | E | G | E | E | E | E |
| n-Butyl Acetate, pure | G | F | G | F | G | F | G | F | G | F | - | - | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | E | G | - | - | - | - | N | N | - | - | E | E | G | N |
| n-Butyl Alcohol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | G | F | F | N | G | F | E | G | E | E | E | E | N | N | E | N | E | G | E | E | E | E |
| n-Decane, pure | F | N | F | N | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | G | F | N | G | F | F | N | G | F | G | F | - | - | - | - | - | - | E | E | E | E |
| n-Heptane, pure | N | N | F | F | F | F | F | F | F | F | E | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | N | N | E | G | N | N | G | G | G | F | E | - | E | E | G | N | G | N | E | E |
| Nitric Acid, 10% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | F | F | N | G | N | E | E | G | N | E | - | G | G | E | N | E | E | E | E |
| Nitric Acid, 20% | E | E | G | G | F | F | G | F | E | E | G | - | E | E | E | E | E | E | E | E | E | E | E | G | E | E | G | N | F | N | G | N | G | G | G | N | E | - | G | G | G | N | E | E | E | G |
| Nitric Acid, 50% | G | F | F | N | F | N | F | N | F | N | G | - | E | E | E | E | E | E | E | E | E | E | G | F | G | F | F | N | F | N | F | N | F | N | F | N | F | N | N | N | N | N | E | E | E | G |
| Nitric Acid, 70% | F | N | F | N | N | N | N | N | F | N | N | N | E | E | E | E | E | E | E | E | E | G | G | N | N | N | N | N | N | N | N | N | F | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Nitrobenzene, pure | N | N | N | N | N | N | N | N | F | N | N | N | E | E | E | E | E | E | E | G | E | G | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | N | N | G | N |
| Nitromethane, pure | N | N | F | N | F | N | F | N | E | F | N | N | E | E | E | E | E | E | E | F | E | G | F | N | N | N | N | N | N | N | N | N | F | N | E | E | - | - | - | - | E | - | - | - | E | G |
| n-Octane, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | - | - | N | N | G | F | N | N | E | E | G | F | - | - | N | N | E | - | E | E | E | E |
| o-Dichlorobenzene, pure | F | N | N | N | F | N | F | N | F | N | N | N | E | E | E | E | E | E | E | N | E | F | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | - | - | E | E |

E - No damage after 30 days of constant exposure.

G - Little or no damage after 30 days of constant exposure.

F - Some effect after 7 days of constant exposure.

N - Immediate damage may occur. Not recommended for continuous use.

| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° |
| Oil, Cedarwood | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | G | F | - | - | N | N | F | F | N | N | - | - | E | E | - | - | G | F | E | E | G | N | E | E |
| Oil, Cinnamon | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | G | G | F | N | N | N | N | F | F | N | N | - | - | E | E | - | - | N | N | E | E | G | N | - | - |
| Oil, Mineral | G | N | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | N | E | G | E | E | E | E | E | N | E | E | E | E | G | N | E | E |
| Oil, Pine | G | N | F | N | E | G | E | G | G | F | - | - | E | E | E | E | E | E | E | G | E | G | G | F | F | N | N | N | F | F | N | N | E | G | E | E | - | - | N | N | E | E | G | N | E | E |
| Orange Oil | F | N | G | F | G | F | G | F | F | F | - | - | E | E | E | E | E | E | E | E | E | E | F | F | F | N | N | N | F | F | N | N | E | G | F | N | - | - | G | F | - | - | - | - | E | E |
| Oxalic Acid, 10% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | G |
| Ozone, pure | G | N | G | N | F | N | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | G | G | F | E | E | F | F | G | N | F | F | E | - | G | G | G | G | N | N | E | E |
| p-Chloroacetophenone, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | N | N | N | N | N | N | N | N | N | E | E | F | N | - | - | - | - | - | - | - | - | N | N |
| p-Dichlorobenzene, pure | F | N | N | N | G | F | G | F | G | F | N | N | E | E | E | E | E | E | E | N | E | F | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | - | - | - | - | E | E |
| Perchloric Acid, 70% | G | N | G | N | G | N | G | N | G | N | - | - | E | E | G | F | E | E | E | G | E | G | N | N | G | N | N | N | N | N | G | F | G | N | G | F | E | E | G | G | F | F | N | N | E | G |
| Perchloric Acid, concentrated | G | N | G | N | G | N | G | N | G | N | - | - | G | F | G | F | G | F | G | F | G | F | N | N | G | N | N | N | N | N | G | F | G | N | G | F | E | E | G | G | F | F | N | N | E | G |
| Perchloric Acid, pure | G | N | G | N | G | N | G | N | G | N | - | - | G | F | G | F | G | F | G | F | G | F | N | N | G | N | N | N | N | N | G | F | G | N | G | F | E | E | G | G | F | F | N | N | E | G |
| Perchloroethylene, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | G | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | F | N | E | G | E | - | N | N | E | E |
| Petroleum | N | N | G | N | N | N | N | N | G | F | - | - | E | E | E | E | E | E | E | E | E | E | F | F | G | N | N | N | F | N | N | N | E | F | F | N | - | - | - | - | E | E | N | N | E | E |
| Phenol, 50% | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | E | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | F | N | N | N | E | G |
| Phenol, 100% | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | F | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | N | N | N | N | E | G |
| Phenol, Crystal | F | N | G | F | G | N | G | N | F | G | N | N | E | E | E | E | E | E | E | E | E | E | N | N | F | N | F | N | F | F | N | N | E | E | N | N | N | N | N | N | N | N | N | N | E | G |
| Phenol, liquid | N | N | N | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | G | E | F | N | N | N | N | N | N | N | N | N | N | F | F | N | N | N | N | N | N | N | N | N | N | E | G |
| Phosphoric Acid, 5% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E |
| Phosphoric Acid, 85% | E | N | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | F | E | E | E | G | E | E | E | G | F | N | E | E | G | F | E | E | E | E |
| Picric Acid, pure | N | N | N | N | N | N | N | N | E | E | - | - | E | E | E | E | E | E | G | F | G | F | N | N | N | N | N | N | N | N | G | F | N | N | G | F | - | - | E | E | - | - | G | N | G | N |
| Pine Oil, pure | G | N | F | N | E | G | E | G | G | F | - | - | E | E | E | E | E | E | E | E | E | E | G | F | F | N | N | N | F | F | N | N | F | N | E | E | - | - | N | N | E | E | - | - | E | E |
| Potassium Chloride, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E | E | E | - | - | E | E | E | G | E | E | E | E |
| Potassium Hydroxide, 1% | E | E | F | F | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | G | E | E | E | G | N | N | E | G | E | - | E | E | E | G | E | E | E | E |
| Potassium Hydroxide, 30% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | N | N | E | E | G | N | E | G | G | G | F | F | E | G | E | - | E | E | G | F | E | E | E | G |
| Potassium Hydroxide, concentrated | E | E | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | F | G | G | F | F | E | G | E | N | E | G | G | F | E | E | E | G |
| Potassium Permanganate, pure | E | E | E | E | E | G | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | F | G | N | E | E | E | G | E | E | E | E | F | N | G | F | - | - | E | E | E | E |
| Propane, gas | N | N | E | E | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | F | N | E | G | F | N | F | F | N | N | E | E | G | F | - | - | E | E | - | - | - | - | E | E |
| Proprionic Acid, pure | F | N | E | F | E | G | E | G | E | F | - | - | E | E | E | E | E | E | E | F | E | G | N | N | G | N | F | N | G | G | G | N | E | F | E | G | - | - | - | - | E | E | - | - | E | E |
| Propylene Glycol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | F | N | G | N | G | G | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E |
| Propylene Oxide, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | N | N | E | F | G | F | F | N | F | N | G | G | N | N | E | E | F | N | - | - | N | N | - | - | - | - | N | N |
| Pyridine, pure | N | N | N | N | E | E | N | N | F | N | - | - | E | E | E | E | E | E | N | N | E | G | N | N | N | N | N | N | N | N | N | N | N | N | F | N | N | N | N | N | - | - | E | N | N | N |
| Resorcinol, 5% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | F | G | F | G | N | N | N | N | N | G | F | E | E | G | G | - | - | G | G | - | - | E | E | E | E |
| Resorcinol, saturated | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | F | F | N | N | N | N | N | G | F | E | E | G | G | - | - | G | N | - | - | E | E | E | E |
| Salicylaldehyde, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | N | E | G | G | F | F | N | N | N | F | F | N | N | E | E | F | N | - | - | N | N | - | - | - | - | E | G |
| Salicylic Acid, powder | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | F | G | F | E | E | E | E | E | E | E | E | - | - | E | G | - | - | E | E | E | E |
| Salicylic Acid, saturated | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | F | G | F | E | E | E | G | E | E | E | E | - | - | E | G | - | - | E | E | E | E |
| sec-Butanol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | N | E | G | G | G | E | E | E | E | - | - | G | N | - | - | E | E | E | E |
| sec-Butyl Alcohol, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | N | E | G | G | G | E | E | E | E | N | N | G | N | - | - | E | E | E | E |
| Silicone Oil, pure | E | G | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | G | E | E | E | E | E | E | F | N | E | E | E | E | - | - | E | E |
| Silver Acetate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | G | G | N | E | E | G | G | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Silver Nitrate, pure | E | G | E | E | E | E | E | G | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | E | E | E | E | E | E | E | - | - | E | G | - | - | E | E | E | E |
| Skydrol LD4 Aviation Hydraulic Fluid | G | F | E | G | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | E | G | F | N | - | - | - | - | F | N | - | - | E | F |
| Sodium Acetate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | F | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Sodium Carbonate, pure | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | G | N | E | G | E | G | F | F | E | G | G | N | E | E | - | - | E | E | E | E |
| Sodium Dichromate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Sodium Hydroxide, 1% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | F | E | E | E | E | N | N | E | G | E | E | E | E | E | G | E | E | E | E |

E - No damage after 30 days of constant exposure. G - Little or no damage after 30 days of constant exposure. F - Some effect after 7 days of constant exposure. N - Immediate damage may occur. Not recommended for continuous use.

| CHEMICAL | LDPE | | HDPE | | PP | | PPCO | | PMP | | PETG | | FEP | | TFE | | PFA | | ECTFE | | ETFE | | PC | | Rigid PVC | | Flex. PVC | | PSF | | PS | | FLPE | | RESMER | | PMMA | | SAN | | PEI | | XLPE | | PVDF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° | 20° | 50° |
| Sodium Hydroxide, 10% | E | E | E | E | E | E | E | E | E | E | G | - | E | E | E | E | E | E | E | E | E | E | N | N | E | E | G | N | E | G | E | E | F | F | E | G | E | E | E | G | E | E | E | E |
| Sodium Hydroxide, 50% | G | G | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | G | E | G | F | F | E | G | E | N | E | G | G | F | E | E | N | N |
| Sodium Hydroxide, concentrated | G | G | E | E | E | E | E | E | E | E | N | N | E | E | E | E | E | E | E | E | E | E | N | N | E | G | F | N | E | G | E | G | F | F | E | G | E | N | E | G | G | F | E | E | N | N |
| Sodium Hypochlorite, 15% | E | F | E | G | F | N | G | N | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | E | F | N | E | E | E | G | F | F | E | G | E | E | E | E | E | G | E | E | E | E |
| Stearic Acid, pure | E | E | G | G | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | G | G | G | E | G | G | G | E | G | - | - | E | G | E | E | E | E | E | E |
| Sulfur Dioxide, dry gas | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | N | G | G | F | N | E | E | F | N | G | N | F | F | - | - | G | N | E | E |
| Sulfur Dioxide, liquid (46 psig) | N | N | F | N | E | E | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | G | G | N | F | N | N | N | G | G | N | N | F | N | F | N | N | N | F | F | - | - | F | N | E | E |
| Sulfur Dioxide, wet gas | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | G | N | G | G | F | N | E | E | F | N | N | N | F | F | - | - | G | N | E | E |
| Sulfur Dioxide, pure | N | N | F | N | E | E | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | G | G | N | F | N | N | N | G | G | N | N | F | N | F | N | N | N | F | F | - | - | F | N | E | E |
| Sulfur Salts, pure | F | N | G | F | F | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | G | F | N | N | N | G | N | G | G | N | N | G | F | - | - | - | - | N | N | - | - | - | - | F | N |
| Sulfuric Acid, 6% | E | E | E | E | E | E | E | E | E | E | E | - | E | E | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E |
| Sulfuric Acid, 20% | E | E | E | E | E | E | E | G | E | E | E | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | F | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E |
| Sulfuric Acid, 30% | E | E | E | E | E | E | E | G | E | E | G | - | E | E | E | E | E | E | E | E | E | E | G | F | E | G | F | N | E | E | E | E | E | E | E | E | E | E | E | G | E | E | E | E | E | E |
| Sulfuric Acid, 60% | E | G | E | G | G | F | G | F | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | E | G | F | N | E | E | E | G | E | G | E | G | N | N | N | N | F | N | G | F | E | E |
| Sulfuric Acid, 96% | G | G | F | N | F | N | F | N | G | F | N | N | E | E | E | E | E | E | E | E | E | E | N | N | F | N | N | N | G | N | F | F | F | N | F | F | N | N | N | N | N | N | F | N | E | E |
| Sulfuric Acid, 98% | G | G | F | N | F | N | F | N | G | F | N | N | E | E | E | E | E | E | E | E | E | G | N | N | F | N | N | N | G | N | F | F | F | N | F | F | N | N | N | N | N | N | F | N | E | G |
| Sulfuric Acid, concentrated | G | G | F | N | N | N | N | N | N | N | N | N | E | E | E | E | E | E | E | E | E | G | N | N | G | N | N | N | N | N | N | N | F | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Tartaric Acid, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | E | G | E | G | E | E | E | G | E | E | E | G | E | E | E | E | E | E | E | E | E | E |
| TCA, pure | F | N | F | N | G | F | F | N | E | E | - | - | E | E | E | E | E | E | E | F | E | G | F | N | F | N | F | N | G | G | F | N | F | N | F | N | - | - | N | N | - | - | E | G | E | G |
| tert-Butanol, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | G | G | F | N | G | F | G | G | E | E | E | E | - | - | E | E | - | - | - | - | E | E |
| tert-Butyl Alcohol, pure | E | G | E | E | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | G | G | F | N | G | F | G | G | E | E | E | E | - | - | E | E | - | - | - | - | E | E |
| Tetrahydrofuran, pure | F | N | F | N | G | F | G | F | F | F | - | - | E | E | E | E | E | E | N | N | G | F | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | - | - | N | N | N | N |
| THF, pure | F | N | F | N | G | F | G | F | F | F | - | - | E | E | E | E | E | E | N | N | G | F | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | - | - | N | N | N | N |
| Thionyl Chloride, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | N | N | N | N | N | N | N | N | N | N | N | N | - | - | - | - | - | - | - | - | N | N | N | N |
| Tincture of Iodine | E | G | G | F | E | E | G | N | N | N | - | - | E | E | E | E | E | E | E | E | E | E | G | N | N | N | G | F | - | - | G | F | G | F | E | G | N | N | - | - | E | F | N | N | E | G |
| Toluene, pure | F | N | N | N | N | N | N | N | F | F | N | N | E | E | E | E | E | E | E | G | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | F | N | N | N | E | E |
| Tributyl Citrate, pure | G | F | E | G | G | F | G | F | G | F | - | - | E | E | E | E | E | E | E | G | E | G | N | N | E | N | N | N | F | F | N | N | E | E | - | - | - | - | - | - | - | - | - | - | E | F |
| Trichloroacetic Acid, pure | F | N | F | N | G | F | F | N | E | E | - | - | E | E | E | E | E | E | E | F | E | G | F | N | F | N | F | N | G | G | F | N | F | N | F | N | - | - | N | N | - | - | E | G | E | G |
| Trichloroethane, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | E | E | G | N | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | N | N | - | - | E | E |
| Trichloroethylene, pure | N | N | N | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | N | N | E | E | N | N | N | N | N | N | N | N | N | N | F | F | F | N | N | N | N | N | N | N | N | N | E | E |
| Triethylene Glycol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | F | F | N | E | E | E | G | E | E | E | E | - | - | E | E | E | E | - | - | E | E |
| Tripropylene Glycol, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | G | G | F | F | N | E | E | E | E | E | E | E | E | - | - | - | - | E | E | - | - | - | - |
| Tris Buffer Solution, pH 11 | E | G | E | G | E | G | E | G | E | G | F | N | E | E | E | E | E | E | E | E | E | E | F | N | E | E | E | G | G | F | G | N | E | G | E | E | E | E | E | E | E | E | E | E | E | E |
| Tris Buffer Solution, pH 7.0 | E | G | E | G | E | G | E | G | E | G | G | G | E | E | E | E | E | E | E | E | E | E | G | F | E | E | E | G | G | F | G | N | E | G | E | E | E | E | E | E | E | E | E | E | E | E |
| Trisodium Phosphate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | G | N | E | E | G | N | G | F | E | E | F | F | E | G | G | N | E | E | - | - | E | E | E | E |
| Turpentine | F | N | F | N | F | N | N | N | F | N | G | - | E | E | E | E | E | E | E | E | E | E | F | N | G | F | F | N | N | N | N | N | G | F | N | N | G | N | G | N | N | N | N | N | E | E |
| Undecyl Alcohol, pure | E | F | E | G | E | G | E | G | E | G | - | - | E | E | E | E | E | E | E | G | E | G | G | F | E | F | G | F | F | F | G | G | E | E | E | E | - | - | E | E | - | - | - | - | E | E |
| Urea, pure | E | E | E | E | E | E | E | E | E | G | - | - | E | E | E | E | E | E | E | E | E | E | G | F | G | N | G | N | F | F | E | G | E | E | E | E | E | E | E | E | E | E | E | E | E | E |
| Vinylidene Chloride, pure | N | N | F | N | N | N | N | N | N | N | - | - | E | E | E | E | E | E | G | F | G | F | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | - | - | - | - | E | E |
| Xylene, pure | N | N | F | N | N | N | F | N | F | N | - | - | E | E | E | E | E | E | E | E | E | G | N | N | N | N | N | N | N | N | N | N | G | F | F | N | N | N | N | N | F | N | N | N | E | E |
| Zinc Chloride, 10% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E | E |
| Zinc Stearate, pure | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | G | G | N | E | E | E | E | E | E | E | E | - | - | E | E | - | - | E | E | E | E |
| Zinc Sulfate, 10% | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E | E | E | E | E | E | E | E | E | E | E | G | N | E | E | E | E | E | E | E | E | E | E | E | E | - | - | E | E | E | E |

E - No damage after 30 days of constant exposure.

G - Little or no damage after 30 days of constant exposure.

F - Some effect after 7 days of constant exposure.

N - Immediate damage may occur. Not recommended for continuous use.

***Sarah Henderson***
*Product Steward*

*24 Waterway Avenue*
*Suite 1200*
*The Woodlands, TX 77380*

*Phone: 832-616-7868*
*SHenderson@amsty.com*

June 24, 2016

**Re: REACH Substances of Very High Concern (SVHC)**

Dear Valued Customer:

Polystyrene resins manufactured by Americas Styrenics LLC are not intentionally manufactured or formulated with any of the substances on the REACH SVHC List. The most recent update to the SVHC list occurred on **June 20, 2016**.

The current SVHC list is available at the following link: http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Therefore, our products meet the regulatory limit of ≤ 0.1 % (w/w) SVHCs imposed by Regulation (EC) No 1907/2006 ("the REACH Regulation").

Please note that we do not analyze for any substances that are not intentionally added to the resin formulations.

Please contact me if you need additional information.

Regards,

Sarah Henderson

# Product Stewardship/Regulatory Summary for GPPS/HIPS

Americas Styrenics LLC has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employees, public health and our environment. The success of our Product Stewardship program rests with each and every individual involved with Americas Styrenics LLC products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## Product Overview

Americas Styrenics manufactures General Purpose Polystyrene (GPPS) and High Impact Polystyrene (HIPS) resins. These resins are available with various physical and mechanical properties and are formulated with additives to affect processability, color, or other characteristics. The resins are available as pellets or granules.

## Chemical Identity

**Common Name:** General Purpose Polystyrene (GPPS)
Also known as vinyl benzene, styrene polymer.
**CAS No**. 9003-53-6

**Common Name:** High Impact Polystyrene (HIPS
Also known as styrene 1,3-butadiene copolymer
**CAS No:** 9003-55-8

## Exposure Potential

### Industrial Worker exposure

Exposure can occur either in a resin manufacturing facility or in the various industrial or manufacturing facilities that use these resins. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. If there is a potential for exposure to dust particles that could cause eye discomfort, wear chemical goggles. Provide general and/or local exhaust ventilation to control airborne dust levels. No other precautions other than clean, body-covering clothing should be needed.

Long sleeves and thermal gloves are necessary in areas where molten polymer is present. If molten material comes in contact with the skin, apply cool water. Do not attempt to remove the material from the skin, but seek medical attention immediately.

### Consumer exposure

Americas Styrenics does not sell resins for direct consumer use, but it is used as a raw material to make many products used by consumers. All our prime grades are approved for food-contact applications.

## Environmental Exposure

Due to the relatively high molecular weight of GPPS/HIPS, bioconcentration (accumulation in the food chain) is not expected. In terrestrial environments, the material is expected to remain in the soil. In aquatic environments, the material is expected to sink and remain in the sediment or bound to dissolved organic materials.
GPPS/HIPS resins are expected to be inert in the environment. Surface photodegradation will occur with exposure to sunlight. No appreciable biodegradation is anticipated. These resins are not likely to be acutely toxic, but material in pellet form may cause adverse mechanical effects if ingested by waterfowl or aquatic life.

**Health Information**
There are few health concerns resulting from handling GPPS or HIPS. Dust or small pellets may cause eye irritation or corneal injury due to mechanical action. Handling these resins is unlikely to cause skin reaction or irritation. If molten resin comes in contact with the skin, thermal burns can occur.
There is a very low risk of toxicity if the product is swallowed; harmful effects are not anticipated from swallowing small amounts. However, choking or blockage of the digestive tract is possible if the product is swallowed. Based on available data, repeated exposures are not anticipated to cause significant adverse effects. Additives are encapsulated in the polymer and are not expected to be released under normal processing conditions.

**Stability Information**
GPPS/HIPS resins are thermally stable at typical use temperatures. However, exposure to elevated temperatures can cause the product to decompose. Under high-heat processing conditions, small amounts of irritating fumes can be released.
To reduce the potential for dust explosion, do not permit dust to accumulate. During a fire, smoke may contain the original material in addition to toxic and/or irritating combustion products of varying composition. In smoldering or flaming conditions, carbon monoxide and carbon dioxide are generated. Dense smoke is produced when the product burns.

The NFPA classification for our polystyrene resins is: 1,1,0 (health, flammability, reactivity).

**Shelf Life**
The shelf life of Americas Styrenics' polystyrene products is 2 years from the date of manufacture.
The shelf life of 2 years for Americas Styrenics polystyrene products is that for which Americas Styrenics LLC guarantees retention of properties as stated in the sales specification, provided the material is properly stored following good manufacturing practices. In general, polystyrene resins when stored properly, will retain a high level of mechanical properties after storage times of many years.
Shelf life or storage time is the time between manufacture at Americas Styrenics and actual processing at the customer location. Guidelines for good storage practice must be followed e.g. storage in a sheltered location, with good ventilation, no direct sunlight and undamaged, original packaging.

**NOTICE: The information presented above is not intended to be a substitute for Material Safety Data Sheets (MSDS). Americas Styrenics LLC strongly encourages and expects its customers to read and understand the product MSDSs prior to use of Americas Styrenics LLC products. We expect you to follow the precautions identified in the MSDS unless your use conditions necessitate other appropriate methods or actions. Americas Styrenics LLC personnel are available to answer your questions and to provide reasonable support if needed. Click here for a list of available MSDSs.**

## Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of polystyrene resins. These regulations may vary by city, state, country, or geographic region
A summary of the regulatory profile of our prime grade polystyrene resins is provided below.
Please note the following:

1. **The information provided below applies only to Americas Styrenics PRIME grade polystyrene resins.**
2. **The information presented in this document is not exhaustive. Additional Information may be found by consulting the relevant Safety Data Sheet (SDS), Technical Data Sheet or by contacting Customer Service.**

### US FDA Food Contact Status

When used unmodified and processed in accordance with good manufacturing practices for food contact applications, all prime grade GPPS and HIPS resins will comply with the U.S. Food and Drug Administration's food additive regulation at 21 CFR § 177.1640, under the Federal Food, Drug, and Cosmetic Act. These products may be used to produce articles or components of articles used in contact with food for all food types described in Table 1 and Conditions of Use C-H described in Table 2 of U.S. FDA's regulation at 21 CFR § 176.170(c).

The preceding statement refers to regulatory requirements only, not to the products' physical utility. The uses cited above are subject to good manufacturing practices and any limitations which are part of the regulations**. It is the responsibility of the article producer or food packager to determine that the article is suitable for its intended use. The regulations should be consulted for complete details.**

### Health Canada - Health Products and Food Branch (HPFB) Status

The GPPS and HIPS resins listed below have been submitted to Health Canada's Food Packaging Materials Section of the Health Products and Food Branch (HPFB) for evaluation and have been granted "No Objection" status for use in general food packaging applications.

- STYRON™ 668
- STYRON™ 695
- STYRON™ 675
- STYRON™ 685D
- STYRON™ 685P
- STYRON™ A-TECH™ 1170
- STYRON™ A-TECH™ 1115
- STYRON™ A-TECH™ 1260
- EB6400
- EC6600
- EB6755
- EA6740
- EA3400
- MC3650
- MC3700
- STYRON™ 421
- STYRON™ 404
- STYRON™ 478
- STYRON™ 484
- STYRON™ 487
- STYRON™ 487R
- STYRON™ 498
- STYRON™ 663
- STYRON™ 666D
- STYRON™ 678C
- STYRON™ 693
- EA3130
- PolyRenew™ PS 1625

The Food Packaging Materials Section advises that each application is considered to be different even if many of the application's parameters are identical to another application for which they have previously offered an opinion.

**Therefore, regardless of the above HPFB opinion, we recommend that you review the specifics of your application with HPFB and acquire the HPFB opinion in regard to your particular application.**

### Drug Master File (DMF)

The following resins currently have an associated Drug Master File on file at FDA.

- STYRON™ 685D
- STYRON™ 685DL
- STYRON™ 685P
- STYRON™ 665
- STYRON™ 675
- STYRON™ 695
- STYRON™ 693
- STYRON™ 610
- STYRON™ 666D
- STYRON™ 668
- EA6740
- EA3130
- EA3400
- MB3150
- MC3650
- MC3700
- STYRON™ 478
- STYRON™ 498
- STYRON™ 484
- STYRON™ 487R
- STYRON™ 421
- EB6400
- EC6600
- EA6740
- EB6755
- EC6600
- XU 36400.00

**Biocompatibility - USP Class VI Plastics certification**
The following products have been tested for compliance against the United States Pharmacopoeia <88> Biological Reactivity Tests *In Vivo* for Class VI Plastics and determined to be compliant with USP Class VI requirements.

- STYRON™ 685D
- STYRON™ 666D
- STYRON™ 478
- STYRON™ 484
- STYRON™ 414
- MC3650
- MC3700
- EB6755
- EA3130
- EA6740
- STYRON™ A-TECH™ 1115

**CONEG**
Cadmium, hexavalent chromium, lead, or mercury is not intentionally introduced as an element during the manufacture or distribution of our polystyrene resins. The sum of the concentration levels of these elements incidentally present is not expected to exceed 100 ppm. Our GPPS and HIPS resins are therefore CONEG compliant.

**RoHS Directive 2011/65/EU (RoHS 2)**
Polystyrene resins manufactured by Americas Styrenics are in compliance with the requirements of EU-Directive 2011/65/EU (RoHS 2).

**Animal Content/BSE/TSE**
Our Polystyrene resins are not intentionally formulated with raw materials of animal origin. These products are formulated with raw materials that are either synthetic or derived from plant sources.

**Allergen Content**
The majority of our resins are not intentionally formulated with raw materials that originate from peanuts, soybeans, milk, eggs, fish, shellfish, tree nuts and/or wheat or gluten.

**Ozone Depleting Substances**
Our Polystyrene resins are not manufactured with Class I or II substances as defined in Title VI of the Clean Air Act of 1990 under the final rule published in the Federal Register on February 11, 1993 (58 FR 8136).

**REACH SVHC Content**
Our Polystyrene resins are not intentionally formulated with any substance classified as a REACH SVHC.

**Underwriters Laboratories (UL)**
Many of our resins are UL listed. Click on the link below for a list of resins:
Americas Styrenics UL Listings

**Miscellaneous**
Polystyrene resins manufactured by Americas Styrenics are not intentionally formulated with the following regulated chemicals or substances of concern (not an exhaustive list):

- Formaldehyde
- Asbestos
- Melamine
- Bisphenol A or Bisphenol F
- Phthalates
- Cadmium & Cadmium Components
- Hexavalent Chromium Compounds
- Lead and Lead Components
- Mercury and Mercury Compounds
- Antimony and Antimony Compounds
- Arsenic and Arsenic Compounds
- Beryllium and Beryllium Compounds
- Bismuth and Bismuth Compounds
- Nickel
- Selenium and Selenium Compounds
- Polyvinyl Chloride (PVC) and PVC blends
- Brominated Organic compounds (PBB, PbDE, DecaBDE)
- Chlorinated Organic Compounds (PCB, PCN, PCT, SCCP)
- Tributyl Tin(TBT) & Triphenyl Tin(TPT)
- Tributyl Tin Oxide (TBTO)
- Latex or Natural Rubber
- Azocolorants and azodyes
- Radioactive Substances
- Perfluorooctane Sulfonate/Perfluorooctanoic Acid (PFOS, PFOA)

**Americas Styrenics Medical Application Policy**

Americas Styrenics will not knowingly sell or sample any product or service ("Product") into any commercial or developmental application that is intended for:

a. permanent (long term) contact with internal body fluids or internal body tissues. "Long term" is defined as a use which exceeds 72 continuous hours.
b. use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems and ventricular bypass assisted devices).
c. use as a critical component in medical devices that support or sustain human life.
d. use in applications designed specifically to promote or interfere with human reproduction.

**Contact Information**

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**Revision history**

The table below documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

| Date | Revised By | Changes |
|---|---|---|
| 3/5/2013 | Melissa Martinez | Updated HPFB, DMF, USP Biocompatibility, RoHS, and Miscellaneous sections. |
| 10/08/2013 | Melissa Martinez | Updated FDA conditions of use, C-H |
| 04/16/2014 | Melissa Martinez | Updated company logo, phone numbers, links, USP |