MATERIAL SAFETY DATA SHEET

Delrin® 100AF, 500AF, TECAFORM™ HPV-13

EMERGENCY TELEPHONE: 724-746-6050 or 856-227-0500
Issue Date: October 1, 1985
Revised Date: May 21, 2004
TRADE NAME: Delrin / Acetal
PART NAME: 100AF, 500 AF, HPV-13

1. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACETAL POLYMER</td>
<td>&gt;75</td>
<td></td>
</tr>
<tr>
<td>STABILIZER</td>
<td>&lt;4</td>
<td></td>
</tr>
<tr>
<td>POLYTETRAFLUORETHYLENE</td>
<td>9002-84-0</td>
<td>&lt;25</td>
</tr>
<tr>
<td>FORMALDEHYDE</td>
<td>50-00-0</td>
<td>&lt;0.005</td>
</tr>
</tbody>
</table>

Components (Remarks)
Material is not known to contain Toxic Chemical under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

2. Hazards Identification

Potential Health Effects

ACETAL POLYMER
There are no known effects from exposure to the Delrin polymer itself. If overheated, the polymer releases formaldehyde which may cause skin, eye, and respiratory irritation and allergic reactions. Significant skin permeation and systemic toxicity after contact appears unlikely. There are inconclusive or unverified reports of human sensitization.

POLYTETRAFLUOROETHYLENE (PTFE)
Inhalation of PTFE dust may cause generalized irritation of the nose, throat, and lungs with cough, difficulty breathing or shortness of breath. Heating PTFE above 300°C may liberate a fine particulate fume. Inhalation may product polymer fume fever, a temporary flu-like condition with fever, chills, nausea, shortness of breath, chest tightness, muscle or joint ache, and sometimes cough and elevated white blood cell count. The symptoms are often delayed 4 to 24 hours after exposure. These signs are generally temporary, lasting 24-48 hours and resolve without further complications. However, some individuals with repeated episodes of polymer fume fever have reported persistent pulmonary effects. Protection against polymer fume fever should also provide protection against any potential chronic effects.

Exposure to decomposition products form PTFE heated above 400°C may cause pulmonary inflammation, hemorrhage or edema. These more serious consequences of exposure may occur from extreme thermal decomposition of PTFE which can liberate fume particles, and toxic gases (carbonyl fluoride, hydrogen fluoride, and other fluorinated gases) especially under conditions of poor ventilation and/or confined spaces. These decomposition products may initially product chest tightness or pain, chills,
fever, nausea, with shortness of breath, cough, wheezing, and progression into pulmonary edema. Edema may be delayed in onset and requires medical treatment. In severe cases, if medical intervention is delayed, pulmonary edema may become life threatening. Recovery is generally complete within a few days; in some rare cases, persistent lung function abnormalities have been reported. Compared to non-smokers, polymer fume fever symptoms appear to be more prevalent and serious in smokers. Smokers must avoid contamination of tobacco with residual polymer from their hands or from fumes, and should wash their hands before smoking. Significant skin permeation, and systemic toxicity, after contact with dust appears unlikely. There are no reports of human sensitization from contact with the dust. If PTFE dusts contact the eye, mechanical irritation with tearing, pain, or blurred vision may result. Individuals with pre-existing diseases of the lungs or cardiovascular system may have increased susceptibility to the reduction in blood oxygen that may develop after excessive exposures to thermal decomposition products.

Carcinogenicity Information
The following components are listed by IARC, NTP, OSHA or ACGIH as carcinogens.

<table>
<thead>
<tr>
<th>Material</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
<th>ACGIH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORMALDEHYDE</td>
<td>2A</td>
<td>X</td>
<td>X</td>
<td>A2</td>
</tr>
</tbody>
</table>

3. First Aid Measures

First Aid

INHALATION
No specific intervention is indicated as the compound is not likely to be hazardous by inhalation. Consult a physician if necessary. If exposed to fumes from overheating or combustion, move to fresh air. Consult a physician if symptoms persist.

SKIN CONTACT
The compound is not likely to be hazardous by skin contact, but cleansing the skin after use is advisable. If molten polymer gets on skin, cool rapidly with cold water. Do not attempt to peel polymer from skin, Obtain medical treatment for thermal burn.

EYE CONTACT
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION
No specific intervention is indicated as compound is not likely to be hazardous by ingestion. Consult a physician if necessary.

4. Fire Fighting Measures

Flammable Properties
Flash Point Not applicable
Dust cloud ignition temperature is 440°C (824°F)
Not a fire or explosion hazard. Burns with invisible flame. Hazardous gases/vapors produced in fire are carbon monoxide, formaldehyde, hydrogen fluoride (HF), and carbonyl fluoride.

Extinguishing Media
Water, Foam, Dry Chemical, CO₂.

Fire Fighting Instructions
Keep personnel removed and upwind of fire. Wear self-contained breathing apparatus. Wear full protective equipment.

5. Accidental Release Measures

Safeguards (Personnel)
NOTE: Revise FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.
Spilled material is a slipping hazard

Spill Clean Up
recover undamaged and minimally contaminated material for reuse and reclamation. Shovel or sweep up.
6. Handling and Storage

Handling (Personnel)
See FIRST AID and PERSONAL PROTECTIVE EQUIPMENT sections.

Handling (Physical Aspects)
Open container on in well ventilated area.

Storage
Store in a well ventilated area away from heat and sunlight. Keep container closed to prevent contamination.

7. Exposure Controls/Personal Protection

Engineering Controls
Use sufficient ventilation to keep employee exposure below recommended limits. Avoid contamination of cigarettes or tobacco with polymer.

Personal Protective Equipment

EYE/FACE PROTECTION
Wear safety glasses. Wear coverall chemical splash goggles and face shield when possibility exists for eye and face contact due to splashing or spraying of molten material.

RESPIRATORS
When temperatures exceed 230°C and ventilation is inadequate to maintain concentrations below exposure limits, use a positive pressure air supplied respirator. Air purifying respirators may not provide adequate protection.

PROTECTIVE CLOTHING
If there is potential contact with hot/molten material, wear heat resistant clothing and footwear.

Exposure Guidelines

Exposure Limits

DELRIN ACETAL RESIN / PTFE BLENDS
PEL (OSHA) Particulates (Not Otherwise Regulated)
15mg/m³, 8 Hr. TWA, total dust
5 mg/m³, 8 Hr. TWA, respirable dust

Other Applicable Exposure Limits

POLYTETRAFLUOROETHYLENE
PEL (OSHA) None Established
TLV (ACGIH) Non Established
AEL* (DuPont) 10 mg/m³, 8 Hr. TWA, total dust
5 mg/m³, 8 Hr. TWA, respirable dust

FORMALDEHYDE
PEL (OSHA) 0.75 ppm, 0.92 mg/m³, 8 Hr. TWA
STEL 2 ppm, 2.5 mg/m³
TLV (ACGIH) Ceiling 0.3 ppm, A2
Sensitizer
AEL* (DuPont) 0.5 ppm, 8 & 12 Hr. TWA
1 ppm, 15 minute TWA

*AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

8. Physical and Chemical Properties

Physical Data
Melting Point 175-183°C (347-361°F)
Solubility in Water Insoluble
Odor Slight formaldehyde
Color Brown
Specific Gravity 1.42 - 1.54
9. Stability and Reactivity

Chemical Stability
Stable at normal temperatures and storage conditions.

Conditions to Avoid
Maintain polymer melt temperatures below 230°C (466°F). Avoid prolonged exposure at or above the recommended processing temperatures.

Incompatibility with Other Materials
Incompatible with strong acids and bases (decomposes forming formaldehyde) and strong oxidizing agents. At melt temperatures, acetal resins are incompatible with halogenated polymers such as PVC and PVDC and any elastomers containing halogenated polymers. Even small amounts of such contaminants can cause sudden and spontaneous formaldehyde gas formation. Workplace fume concentrations well above threshold levels are a likely result. Unsafe pressurization of equipment, e.g., extruders, molds, can also result.

Do not contaminate either virgin resin or rework. Do not mix this resin with pigments or additives other than those designated by DuPont. Do not mix this grade with other grades of Delrin, nor with any other resins, without first consulting DuPont. Doing any of the above may change the thermal stability of this resin and potentially cause decomposition.

Decomposition
Decomposition of this material depends on the length of time it is exposed to elevated temperatures. At the recommended processing temperature of 210-220°C (410-428°F), decomposition should not be significant until after 30 minutes. Decomposition may be accelerated by contaminants, pigments, and/or other additives.

Autoclaving with pressurized steam may lead to a rapid decomposition and should be done for only minimum amounts of time. COOL COMPLETELY BEFORE OPENING the autoclave.

Hazardous gas/vapor produced is formaldehyde.

Polymerization
Polymerization will not occur.

10. Toxicological Information

Animal Data
Delrin
Inhalation 6 hour LC50: > 22,000 mg/m^3 in rats
Oral LD50: > 11,000 mg/kg in rats
Delrin is not a skin irritant, and is not a skin sensitizer in animals.

Single or repeated inhalation exposures to high concentrations of Delrin dust resulted in collapse of some collapse of the lungs, other areas were over inflated. This effect was seen as late as 11-19 days post-exposure. No toxic effects were observed in animals ingesting Delrin.

No animal test reports are available to define carcinogenic, mutagenic, developmental, or reproductive hazards.

PTFE
Animal testing indicated that PTFE is not a skin irritant.
Repeated exposure to PTFE by ingestion caused significant toxicological effects. Possible effects on white blood cell counts were found in rats fed 25% PTFE in the diet for 90 days, however any changes were within normal variability and were considered to be of no toxicological significance.

In rats, single exposure to dusts of undegraded PTFE by inhalation caused irritation of the lungs. Exposure to thermal decomposition products of PTFE caused lung injury whose severity depends upon the temperature and exposure conditions. Birds appear to be especially susceptible to the toxic effects of fluoropolymer decomposition products. In rats, exposure to freshly formed low molecular weight polymer fragments (fume) produced by continuous heating of the polymer above 400°C may produce acute pulmonary inflammation. When the concentration of fluoropolymer fragment fumes increases, deaths may occur from pulmonary edema and hemorrhage. Exposure to fume aged for several minutes markedly reduces the toxicity. At higher temperatures involving gross thermal decomposition of the polymer, deaths occurred due to pulmonary edema from lethal concentrations of fluoropolymer fume and/or fluorinated gas decomposition products.

No adequate animal data are available to define the carcinogenicity or developmental hazards of PTFE.
No adequate reports of genetic testing were found. No animal data are available to define the reproductive toxicity of PTFE.
### 11. Ecological Information

**Ecotoxicological Information**
**AQUATIC TOXICITY:**
No information available. Toxicity is expected to be low based on insolubility in water.

### 12. Disposal Considerations

**Waste Disposal**
Preferred options for disposal are (1) recycling and (2) landfill. Incinerate only if incinerator is capable of scrubbing out hydrogen fluoride and other acidic combustion products. Treatment, storage, transportation, and disposal must be in accordance with applicable federal, state/provincial, and local regulations.

*This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe this information to be correct but cannot guarantee its accuracy or completeness. Health and safety precaution in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulation. No statement made in the data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.*