Introduction

The purpose of this bulletin is to present available information on the toxic potential of DuPont™ Neoprene polychloroprene water-based polychloroprene liquid dispersions (LDs) and to provide recommendations for handling current commercial LD products. This bulletin relates only to LD manufactured by DuPont.

This technical bulletin also reports the status of DuPont™ Neoprene LDs with respect to the Food and Drug Administration regulations. Table 2 contains information on the compliance of these products with specific regulations. A brief description of pertinent FDA regulations for the LDs and certain commonly used compounding ingredients is provided.

Composition

Neoprene LDs are colloidal dispersions of chloroprene polymers prepared by emulsion polymerization. Analyses of DuPont LDs indicate that in addition to residual amounts of monomers and some other volatile organic materials, Neoprene LDs also contain reaction products of polymerization catalysts, molecular weight modifiers and polymer stabilizers. The volatile materials in Neoprene LDs include butadiene, diisobutylene, toluene, dichlorobutadienes, dichlorobutadiene dimers, chloroprene dimers, and two isomers of chloroprene (2-chlorobutadiene and 1-chlorobutadiene). The concentration of chloroprene monomer varies in Neoprene LDs from a maximum of 0.099% down to 0.02%.

An excess of sodium or potassium hydroxide is used in the manufacture of Neoprene LDs to form the organic acid soaps present in the preparation of the monomer emulsion. Therefore, the Neoprene LDs are strongly alkaline, as indicated by a pH of 11.5 or greater.

The amount of free alkali in the water phase of most Neoprene LDs will vary between 0.1 and 0.8% by weight depending upon the age and type of LD.

Potential Hazards of Neoprene LDs

BEFORE USING, READ THE MATERIAL SAFETY DATA SHEET (MSDS). (See neoprene.dupont.com for MSDS.)

Oral Toxicity

DuPont LDs exhibit a very low order of oral toxicity. The median lethal dose in rats (LD50) of Neoprene 842A is greater than 40,000 mg/kg of body weight.

Inhalation

Neoprene LDs contain residual volatile organic materials. Exposure to these materials should be limited as indicated in Table 1.

Eye and Skin Irritation

Neoprene LDs are strongly alkaline.
Strongly Alkaline Dispersions

Strongly alkaline dispersions of LD can be irritating to eyes and skin. Ocular irritation in animal studies utilizing the strong alkaline dispersions resolved within 7 days following treatment.

DuPont™ Neoprene LDs are not corrosive relative to U.S. Department of Transportation Test Docket HM57. They were also found not to be corrosive when tested in accordance with the procedure outlined in the UN Manual of Tests & Criteria, Part III, Section 37, as referred to in 49 CFR173.137.

Safety in Handling Liquid Dispersions

Labels for Neoprene LD shown below reflect the potential for skin and eye irritation. As indicated on the labels, avoid contact with eyes, skin and clothing. Avoid breathing vapor. Use with adequate ventilation. Wash thoroughly after handling. Discard shoes if contaminated. LDs penetrate leather slowly and may cause irritation or blisters.

Warning: May cause skin and eye irritation with possible clouding of the eye. Avoid contact with eyes, skin and clothing. Avoid breathing vapor. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. BEFORE USING, READ THE MATERIAL SAFETY DATA SHEET (MSDS).

FIRST AID: In case of eye contact, immediately flush eyes with plenty of water for at least 15 min. If vapors are inhaled, remove to fresh air. If not breathing, give artificial respiration. Call a physician. For skin, flush thoroughly with plenty of water. Wash contaminated clothing before reuse. Discard shoes if contaminated; liquid dispersions penetrate leather slowly and may cause irritation or blisters. Call 1-800-441-3637 in case of Medical Emergency.

Spill: Flush small spills with water. Soak up large spills with sand or earth and remove. See MSDS for details.

Minimum Storage Temperature + 13°C [55°F] DO NOT REMOVE LABEL UNTIL CONTAINER IS CLEANED.

Made in U.S.A. by DuPont
Wilmington, DE 19809 USA, 1-800-853-5515
Table 1. Limits for Employee Exposure to Volatile Materials in DuPont™ Neoprene LD

<table>
<thead>
<tr>
<th>Material</th>
<th>Limit (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butadiene</td>
<td>1&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;2,4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Chloroprene&lt;sup&gt;3&lt;/sup&gt;</td>
<td>25&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>10&lt;sup&gt;2&lt;/sup&gt;, 2&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diisobutylene</td>
<td>300&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>Toluene</td>
<td>200&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>50&lt;sup&gt;2,4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Chloroprene dimmers</td>
<td>no established limit</td>
</tr>
<tr>
<td>2,3-Dichloro-1,3-butadiene</td>
<td>2&lt;sup&gt;4&lt;/sup&gt; AIEL was lowered from 5 to 2 in late 2005</td>
</tr>
<tr>
<td>Methacrylic acid</td>
<td>20&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>1</sup>U.S. Department of Labor (OSHA) time weighted average (TWA) for any 8-hr work shift of a 40-hr work week. (CFR Title 29, part 1910.1000 Air Contaminants). Users of Neoprene LD outside the USA should give attention to regulations or guidelines that apply to the countries in which their operations are located.

<sup>2</sup>Threshold Limit Values are developed by the American Conference of Governmental Industrial Hygienists.

<sup>3</sup>The TLV was developed by the ACGIH for 2-chlorobutadiene. A certain amount of the volatile components may be the 1-chloro derivative; there is no TLV for this compound.

<sup>4</sup>DuPont Allowable Exposure Limit (AEL)


**Eye and Skin Protection**

Eye protection should be used as a matter of course in operations where raw LD and/or LD compounds are handled. Gloves, long sleeve shirts or other appropriate skin protection should be used in those situations where splashes or spills are possible.

In case of eye contact, immediately flush eyes with plenty of water for at least 15 min. Call a physician. Eye contact may cause eye irritation with tearing, pain, or blurred vision, corneal opacity or clouding of the eye. In case of skin contact, flush skin with water. Contaminated clothing should be washed before reuse. Discard shoes if contaminated. LDs penetrate leather slowly and may cause irritation or blisters some time after actual exposure.

**Compounding Ingredients**

Compounding ingredients used with Neoprene LDs in the preparation of finished products may present hazards in handling and use. Before proceeding with any compounding work, consult and follow label directions and handling precautions from suppliers of all ingredients.

**Storage**

Neoprene LDs should be transferred and stored under conditions which will preserve and protect the colloidal properties of the dispersion and the chemical properties of the polymer. The LDs are perishable if frozen. For details, consult DuPont technical bulletin “Transfer and Storage of Neoprene Liquid Dispersions (NPE-H68232)”. Alkaline LDs should not be stored or transferred in aluminum containers.

**Disposal**

Small spills of Neoprene LDs can be safely flushed to a drain, if allowed by applicable Federal, State/Provincial, and Local regulations.

Repetitive spills or large spills (more than 4 liters [1 gallon]) may cause plugging of drain systems due to coagulation of the polymer, as well as regulatory problems related to waste water discharge. Large spills of the LDs are best cleaned up by absorbing the liquid on solid materials (Vermiculite, clay, etc.) or by adding aqueous electrolyte to coagulate the polymer for disposal in an approved landfill.

All treatment, storage, transportation and disposal must be in accordance with applicable Federal, State/Provincial and Local regulations.

Some Neoprene LDs are regulated by EPA under disposal of hazardous wastes due to high pH levels in excess of 12.5 (EPA Number D002). If pH is lowered before disposal, the LDs are not regulated (Federal Register, May 19, 1980, page 33122).
The discharge of waste water from manufacturing operations to municipal sewers and waterways is subject to a variety of national and local regulatory requirements. Each user must consider the requirements applicable to its local facility in relation to LD compounds used and the disposal methods selected. In general, LD streams should not be discharged directly into waterways. An acceptable treatment practice, subject to regulatory agency approval, is to discharge LD wastewater to a coagulation basin to remove polymer. The effluent from the coagulation basin must meet the biological and chemical oxygen demands for the district as well as controls on specific chemical pollutants.

Table 2. Compliance of DuPont™ Neoprene LDs with FDA Regulations

<table>
<thead>
<tr>
<th></th>
<th>Adhesives</th>
<th>Coatings</th>
<th>Paper</th>
<th>Rubber Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoprene 571</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Neoprene 671A</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Neoprene 750</td>
<td>Yes</td>
<td>Yes*</td>
<td>— **</td>
<td>Yes</td>
</tr>
<tr>
<td>Neoprene 842A</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Neoprene LD 750 may be considered acceptable for use in all applications of the type covered by 21 C.F.R. §§ 175.300(b)(3)(xxxi) and (xxxii).
** Contact your DuPont representative for information on compliance relating to specific food contact uses.

FDA Status of Neoprene

**Applicable FDA Regulations**

Reference: 21 CFR 175.105 — Adhesives

Included in this regulation are materials that may be used as components of adhesives for packaging, transporting, or holding food where the adhesive is either separated from the food by a functional barrier; or in the case of aqueous and fatty foods, where the quantity of adhesive that contacts the food is limited to a minimal amount.

Reference: 21 CFR 175.300 — Resinous and Polymeric Coatings

Resinous and polymeric coatings may be safely used as the food-contact surface of articles intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting or holding food. The coating is applied as a continuous film or enamel over a substrate so that the coating serves as a functional barrier between the food and the substrate.

Reference: 21 CFR 176.170 — Components of Paper and Paperboard in Contact with Aqueous and Fatty Foods

Substrates identified in this section may be safely used as components of the uncoated or coated food-contact surface of paper and paperboard intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding aqueous and fatty foods, subject to the provisions of this section.

Reference: 21 CFR 177.2600 — Rubber Articles Intended for Repeated Use

This regulation defines the polymers and compounding ingredients that can be used in rubber articles intended for repeated use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food. There are limitations on the amount of certain compounding ingredients:

- Accelerators, total not to exceed 1.5% by weight of rubber product;
- Retarders, total not to exceed 10% by weight of rubber product;
- Activators, total not to exceed 5% by weight of rubber product, except magnesium oxide may be used at higher levels;
- Antioxidants and antiozonants, total not to exceed 5% by weight of rubber product;
• Plasticizers, total not to exceed 30% by weight of rubber product;
• Fillers, no maximum given except for carbon black; channel process or furnace combustion process, total not to exceed 50% by weight of rubber product; furnace combustion black content not to exceed 10% by weight of rubber products intended for use in contact with milk or edible oils;
• Colorants used in accordance with 21 CFR 178.3297
• Lubricants, total not to exceed 2% by weight of rubber product
• Emulsifiers, no maximum given
• Sulfur, no maximum given

Substances Generally Recognized as Safe
Part 182 lists substances which are ‘generally recognized as safe’ for food contact use. Some of these substances, listed below, are used as compounding ingredients for DuPont™ Neoprene:

Section 182.5191 Calcium Carbonate
Section 182.5210 Calcium Oxide
Section 182.5431 Magnesium Oxide
Section 182.5991 Zinc Oxide

Ingredients Restricted by FDA
Part 189 lists substances which, if used in contact with food, cause the food to be deemed adulterated. Ethylene thiourea, a common accelerator for Neoprene is listed in 21 CFR 189.250. Neoprene polymers cured with ethylene thiourea may not be used in contact with food.

Comments
In the application or conversion of these DuPont™ Neoprene LDs to end products, compounding additives and techniques are employed which may alter the toxicity and safe handling of the end product. Consequently, each LD user must determine best practices for processes and additives that comply with applicable governmental regulations and are safe both with respect to employees and customers. This bulletin about Neoprene liquid dispersions is offered as a guideline only.

Information on European Union Dangerous Preparations Directive 1999/45/EC related to Colophony Skin Sensitization
Colophony is classified as a skin contact sensitizer under European Union Dangerous Preparations Directive 1999/45/EC effective July 30, 2002. This Directive requires labeling of products that contain colophony at levels equal to or greater than 0.1% (refer to the Directives for specific details). Neoprene polychloroprene manufactured by DuPont contain 2 to 3% by weight of sodium and/or potassium salts of various dihydroabietic and pimaric acids (resin acids) as emulsifiers. In contrast to the resin acids, these resin salts are not classified as sensitizers. Consequently, the waterbased polychloroprenes products from DuPont are not subject to mandatory labeling under the above Directive. However, depending upon the formulation and the processing of these waterbased polychloroprenes the original pH value of approximately 13 may be reduced to a range where some of the salts of the resin acids may be converted into the corresponding resin acids (colophony).

We recommend that manufacturers and marketers of products based on DuPont™ Neoprene determine whether the resin salt emulsifiers have been, or could be, converted to the free acids (colophony). If the manufactured preparation has a colophony content of less than 0.1% it will not be subject to mandatory labeling (provided no other constituents necessitate mandatory labeling). Manufactured preparations that contain higher colophony contents will require the labeling and/or container notices described in the Directive.
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Contact DuPont at the following regional locations:

<table>
<thead>
<tr>
<th>Region</th>
<th>North America</th>
<th>Latin America</th>
<th>Europe, Middle East, Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>800-222-8377</td>
<td>+0800 17 17 15</td>
<td>+41 22 717 51 11</td>
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<tr>
<td>Latin America</td>
<td></td>
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<tr>
<td>Greater China</td>
<td>+86-400-8851-888</td>
<td>+65-6586-3688</td>
<td>+81-3-5521-8484</td>
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<tr>
<td>ASEAN</td>
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<td>Japan</td>
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Caution: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your DuPont customer service representative and read Medical Caution Statement H-50103-3.

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