SAFETY DATA SHEET

Product: Polymer Dielectric

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Trade Name
Color
Pure substance/preparation
Synonyms

xdi-dcs
Yellow
Preparation
Polymer Dielectric

Identified uses

Printed circuit or other electronic applications

Supplier Address

Raymor Nanotech, division of
Raymor Industries Inc.
3765 La Vérendrye
Boisbriand, Quebec, J7H 1R8
CANADA
Phone No.: +1 450.434.1004

Responsible/issuing person
Contact person
Emergency telephone

EHS Department
Transportation Emergency: CANUTEC at 613-996-6666

Classification of the substance or mixture

Classification of this mixture is based on the characteristics of the components. The product has not been completely analyzed and all of the hazards may not be known. Please use caution while handling this product

GHS - Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 4</td>
<td>Acute Oral Toxicity</td>
</tr>
<tr>
<td>Category 2</td>
<td>Skin Corrosion/Irritation</td>
</tr>
<tr>
<td>Category 1</td>
<td>Serious Eye Damage/Eye Irritation</td>
</tr>
<tr>
<td>Category 2</td>
<td>Carcinogenicity</td>
</tr>
<tr>
<td>Category 3</td>
<td>Specific Target Organ Toxicity (Single Exposure)</td>
</tr>
<tr>
<td>Category 3</td>
<td>Flammable liquids</td>
</tr>
</tbody>
</table>

GHS Label elements, including precautionary statements

Symbol(s)
Signal Word: Danger

**Hazard Statements**

- H226 - Flammable liquid and vapor
- H302 - Harmful if swallowed
- H315 - Causes skin irritation
- H318 - Causes serious eye damage
- H351 - Suspected of causing cancer

**Precautionary Statements**

- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- P233 - Keep container tightly closed
- P240 - Ground/Bond container and receiving equipment
- P241 - Use explosion-proof electrical/ventilating/lighting/equipment
- P242 - Use only non-sparking tools
- P243 - Take precautionary measures against static discharge
- P240 - Ground/Bond container and receiving equipment
- P280 - Wear protective gloves/protective clothing/eye protection/face protection
- P264 - Wash hands thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P332 + P313 - If skin irritation occurs: Get medical advice/attention
- P362 - Take off contaminated clothing and wash before reuse
- P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
- P330 - Rinse mouth
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P308 + P313 - IF exposed or concerned: Get medical advice/attention
- P321 - Specific treatment (see supplemental first aid instructions on this label)
- P370 + P380 + P375 - In case of fire, use water/water spray/water jet/carbon dioxide/sand/foam/alcohol resistant foam/chemical powder for extinction
- P403 + P235 - Store in a well-ventilated place. Keep cool
- P405 - Store locked up
- P501 - Dispose of contents/container to an approved waste disposal plant

**Other hazards which do not result in classification**

None known
SAFETY DATA SHEET

Product: Polymer Dielectric

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>EC-No</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Butyl alcohol</td>
<td>71-36-3</td>
<td>72-81</td>
<td>Present</td>
</tr>
<tr>
<td>4-methyl-2-pentanone</td>
<td>108-10-1</td>
<td>4.5-5.5</td>
<td>Present</td>
</tr>
<tr>
<td>Resin</td>
<td>NOT AVAILABLE</td>
<td>4.5-5</td>
<td>-</td>
</tr>
<tr>
<td>Poly(4-vinyl phenol)</td>
<td>24979-70-2</td>
<td>4.5-9</td>
<td>-</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>2-3</td>
<td>Present</td>
</tr>
<tr>
<td>Part B, proprietary polymer</td>
<td>NOT AVAILABLE</td>
<td>2-3</td>
<td>-</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Description of necessary first-aid measures

General advice
Consult a physician. Show this material safety data sheet to the doctor in attendance. Move victim to a safe isolated area.

Eye contact
Hold eye open and rinse slowly and gently with water for 15-20 minutes. Get medical attention if irritation persists.

Skin contact
Wash off immediately with soap and plenty of water. Remove and wash contaminated clothing before re-use. If skin irritation persists, call a physician.

Inhalation
Move to fresh air. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.

Ingestion
Do NOT induce vomiting. Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention. Call a physician or Poison Control Center immediately.

Protection of first-aiders
Use personal protective equipment.

Most important symptoms/effects, acute and delayed

Main symptoms
Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash point
Not Tested
35 deg C for n-Butanol

Suitable extinguishing media
Dry chemical. Alcohol-resistant foam. Carbon dioxide (CO₂). Water spray.
Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

Specific hazards arising from the chemical
Vapors may travel to areas away from work site before igniting/flashing back to vapor source Flash back possible over considerable distance

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal Precautions
Use personal protective equipment. Avoid breathing vapors or mists. Remove all sources of ignition. All equipment used when handling the product must be grounded.

Environmental Precautions
Do not allow material to contaminate ground water system. Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up

Methods for containment
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see Section 13) Dike to collect large liquid spills Do not dispose of waste into sewer

Methods for cleaning up
Soak up with inert absorbent material. Prevent product from entering drains. Ground and bond containers when transferring material. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

Other information
See Section 12 for additional Ecological information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Take precautionary measures against static discharges. Keep away from open flames, hot surfaces and sources of ignition. Do not eat, drink or smoke when using this product.

Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions
Keep away from open flames, hot surfaces and sources of ignition. Keep containers in cool areas out of direct sunlight and away from combustibles.

Incompatible products
Strong oxidizing agents Strong acids Acid anhydrides
Safety Data Sheet

Product: Polymer Dielectric

8. Exposure Controls/Personal Protection

Control Parameters

Exposure Limits

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>European Union</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-Butyl alcohol</td>
<td>TWA: 20 ppm</td>
<td></td>
<td>Ceiling: 50 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ceiling: 150 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ISHL/ACL: 25 ppm</td>
</tr>
<tr>
<td>4-methyl-2-pentanone</td>
<td>STEL: 75 ppm, TWA: 20 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA: 20 ppm</td>
<td>TWA: 20 ppm</td>
<td>OEL: 50 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 83 mg/m³, TWA: 20 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA: 83 mg/m³</td>
<td>STEL: 50 ppm</td>
<td>OEL: 590 mg/m³</td>
</tr>
<tr>
<td></td>
<td>STEL: 208 mg/m³</td>
<td>STEL: 208 mg/m³</td>
<td>ISHL/ACL: 20 ppm</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>STEL: 100 ppm, TWA: 50 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA: 50 ppm</td>
<td>TWA: 50 ppm</td>
<td>OEL: 200 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 150 mg/m³</td>
<td>STEL: 150 mg/m³</td>
<td>OEL: 590 mg/m³</td>
</tr>
<tr>
<td></td>
<td>STEL: 300 mg/m³</td>
<td>STEL: 300 mg/m³</td>
<td>ISHL/ACL: 50 ppm</td>
</tr>
</tbody>
</table>

Appropriate Engineering Controls

Engineering Measures

Individual Protection Measures, such as personal protective equipment (PPE)

Personal Protective Equipment

General Information

If the product is used in mixtures, it is recommended that you contact the appropriate protective equipment suppliers. These recommendations apply to the product as supplied.

Eye/Face Protection

Skin and Body Protection

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Hand Protection

Impervious gloves Butyl rubber Teflon™, 4H™, Viton™

Hygiene Measures

Do not eat, drink or smoke when using this product. Wash hands before breaks and at the end of workday.

9. Physical and Chemical Properties

General Information

Physical State: Liquid
Appearance: No information available
Color: Yellow
Odor: No information available
Odor Threshold: No information available
SAFETY DATA SHEET

Product: Polymer Dielectric

Important health safety and environmental information

- pH: No information available
- Flash point: Not Tested
- Autoignition temperature: No information available
- Boiling point/range: 117.7 °C for n-butanol
- Vapor pressure: 4.0 mm of Hg (@20°C) for n-butanol
- Vapor density: 2.55 (Air=1) for n-butanol
- Water solubility: No information available
- Partition coefficient: No information available
- Viscosity: Not applicable
- Specific gravity: 0.810 (water=1) @ 20°C for n-butanol
- Decomposition temperature: No information available
- Evaporation rate: No data available
- Flammability Limits in Air:
  - Upper: 11.2%
  - Lower: 1.4%

Other information

- Softening point: No information available
- Melting point/range: Not applicable
- Freezing point: -89.3 °C n-butanol.

10. STABILITY AND REACTIVITY

Reactivity

No dangerous reaction known under conditions of normal use.

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

None under normal processing.

Conditions to Avoid

Heat, flames and sparks. Take precautionary measures against static discharges.

Materials to Avoid

Strong oxidizing agents, Strong acids, Acid anhydrides

Hazardous Decomposition Products

Carbon oxides. Nitrogen oxides (NOx).

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information

- Irritation: Irritating to eyes and skin
- Oral LD50: ATE = 970 mg/kg Rat (based on calculation for mixture)
- Dermal LD50: No known effect based on component data.
- LC50 Inhalation: See component information.
Toxicokinetics, metabolism and distribution

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

Eyes
Avoid contact with eyes, Irritating to eyes, Risk of serious damage to eyes

Skin
Prolonged skin contact may defat the skin and produce dermatitis

Inhalation
Avoid breathing vapors or mists, No known effect based on information supplied

Ingestion
Do not taste or swallow

No information available

Component Information

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Oral LD50</th>
<th>Dermal LD50</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Butyl alcohol</td>
<td>700 mg/kg (Rat)</td>
<td>3402 mg/kg (Rabbit)</td>
<td>8000 ppm (Rat) 4 h</td>
</tr>
<tr>
<td>4-methyl-2-pentanone</td>
<td>2080 mg/kg (Rat)</td>
<td>3000 mg/kg (Rabbit)</td>
<td>8.2 mg/L (Rat) 4 h</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>1650 mg/kg (Rat)</td>
<td></td>
<td>21000 ppm (Rat) 3 h</td>
</tr>
</tbody>
</table>

Main symptoms
Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Aggravated medical conditions
None known

Chronic toxicity

Sensitization
No information available

Neurological Effects
No information available

Target organ effects
No information available

Other adverse effects
No information available

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EU - Endocrine Disrupters Candidate List</th>
<th>EU - Endocrine Disruptors - Evaluated Substances</th>
<th>Japan - Endocrine Disruptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Group III Chemical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CMR Effects

Carcinogenicity
Carcinogenic potential is unknown. This material has not been tested for carcinogenicity. Mixture contains component that is considered to be a carcinogen.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>IARC</th>
<th>NTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-methyl-2-pentanone</td>
<td>2B</td>
<td></td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

Ecotoxicity
Ecotoxicity effects of component substances.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Toxicity to algae</th>
<th>Toxicity to daphnia and other aquatic invertebrates</th>
<th>Toxicity to fish</th>
<th>Toxicity to microorganisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Butyl alcohol</td>
<td>500 mg/L Ec50 96 h</td>
<td>Ec50 = 1983 mg/L 48 h</td>
<td>LC50 1730 - 1910 mg/L</td>
<td>Pimephales promelas 96 h</td>
</tr>
<tr>
<td></td>
<td>(Desmodesmus subspicatus)</td>
<td>Ec50 = 1897 - 2072 mg/L 48 h</td>
<td>LC50 100000 - 500000 µg/L</td>
<td>Pimephales promelas 96 h</td>
</tr>
<tr>
<td></td>
<td>500 mg/L Ec50 72 h</td>
<td></td>
<td>LC50 1740 mg/L</td>
<td>Pimephales promelas 96 h</td>
</tr>
<tr>
<td></td>
<td>(Desmodesmus subspicatus)</td>
<td></td>
<td>Lepomis macrochirus 96 h</td>
<td></td>
</tr>
<tr>
<td>4-methyl-2-pentanone</td>
<td>400 mg/L Ec50 96 h</td>
<td>Ec50 = 170 mg/L 48 h</td>
<td>LC50 496 - 514 mg/L</td>
<td>Pimephales promelas 96 h</td>
</tr>
<tr>
<td></td>
<td>(Pseudokirchneriella subcapitata)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Print Date: July 8, 2016
MSDS Document Number: xdi-dcs-01-E
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Product: Polymer Dielectric

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Butyl alcohol</td>
<td>0.785</td>
</tr>
<tr>
<td>4-methyl-2-pentanone</td>
<td>1.19</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>0.45</td>
</tr>
</tbody>
</table>

**Mobility**
No information available.

**Persistence and degradability**
No information available.

**Bioaccumulative potential**
No information available.

13. DISPOSAL CONSIDERATIONS

Waste from Residues/Unused Products
Dispose of in accordance with local regulations.

Contaminated packaging
Dispose of in accordance with local regulations. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

**Note**
Subject to regulation as noted below

**TDG**
UN/ID No 2924
Hazard class Class 3: Flammable liquid
Subsidiary Class Class 8: Corrosive Liquid
Proper shipping name Flammable Liquid, Corrosive, N.O.S
Packing Group III

15. REGULATORY INFORMATION

**International Inventories**

TSCA Research & Development Exempt
DSL/NDSL Research & Development Exempt

**Legend**
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

**National regulatory information**
No information available

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Australia - National Pollutant Inventory (NPI) Substance List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butanol - 71-36-3</td>
<td>20 60000</td>
</tr>
</tbody>
</table>
SAFETY DATA SHEET

Product: Polymer Dielectric

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Restrictions on use</th>
<th>Threshold limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-methyl-2-pentanone - 108-10-1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran - 109-99-9</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Butanol - 71-36-3</td>
<td>3</td>
<td>SCDBNO1120L2</td>
<td></td>
</tr>
<tr>
<td>4-methyl-2-pentanone - 108-10-1</td>
<td>3</td>
<td>SCDMIK1245L2</td>
<td></td>
</tr>
<tr>
<td>Tetrahydrofuran - 109-99-9</td>
<td>3</td>
<td>SCDTHF2056L2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Banned and/or restricted</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Butanol - 71-36-3</td>
<td>01/2006/TT-BCN</td>
<td></td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Issuing Date: 2015-07-14
Revision Date: 2016-07-07
Revision Note: No information available.
Sources of key data used to compile the datasheet:
• SDS of components.

Disclaimer

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The information contained herein was not obtained from toxicology assays using our single-wall carbon nanotubes but gathered from literature.