1 - Product and Company Information

Product Name                  2,5-BIS(TERT-BUTYLPEROXY)-2,5-DIMETHYL-HEXANE, TECH., 90% (LUPEROX 101)
Product Number               388092
Company                      Sigma-Aldrich Pty. Ltd.
                            12 Anella Avenue
                            Castle Hill NSW 2154
                            Australia
Technical Phone #            +61 2 9841 0555 (1800 800 097)
Fax                          +61 2 9841 0500 (1800 800 096)
E-mail Address               ausmail@sial.com
Emergency Phone #            +44 8701906777 (1800 448 465)

2 - Hazards Identification

SPECIAL INDICATION OF HAZARDS TO HUMANS AND THE ENVIRONMENT
May cause fire. Irritating to eyes, respiratory system and skin.

3 - Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Product Name</th>
<th>CAS #</th>
<th>EC no</th>
<th>Annex I Index Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,5-BIS(TERT-BUTYLPEROXY)-2,5-DIMETHYL-</td>
<td>78-63-7</td>
<td>201-128-1</td>
<td>None</td>
</tr>
<tr>
<td>HEXANE, 90% TECH.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>Percent</th>
<th>CAS #</th>
<th>EC no</th>
<th>Annex I Index Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,5-BIS(TERT-BUTYLPEROXY) &gt;= 93</td>
<td></td>
<td>78-63-7</td>
<td>201-128-1</td>
<td>None</td>
</tr>
<tr>
<td>-2,5-DIMETHYL-HEXANE &lt;= 95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbols: O-Xi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Phrases: 7-36/37/38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May cause fire. Irritating to eyes,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>respiratory system and skin.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMPURITIES:
None

<table>
<thead>
<tr>
<th>Product Name</th>
<th>CAS #</th>
<th>EC no</th>
<th>Annex I Index Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,3,6,6-TETRAMETHYL-1,2-D&lt;= 6</td>
<td>22431-89-6</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IOXACYCLOHEXANE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI-TERT-BUTYL PEROXIDE &lt;= 4</td>
<td>110-05-4</td>
<td>203-733-6</td>
<td>617-001-00-2</td>
</tr>
<tr>
<td>Symbols: O-F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Phrases: 7-11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May cause fire. Highly flammable.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,5-DIMETHYL-2,5-DIHYDRO- &lt;= 1</td>
<td>3025-88-5</td>
<td>221-184-0</td>
<td>None</td>
</tr>
<tr>
<td>PEROXYHEXANE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbols: O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Phrases: 7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
May cause fire.

Formula: C₁₆H₃₄O₄
Molecular Weight: 290.45 AMU
Synonyms:
- AD 40C
- CR 05
- CT 8 (crosslinking agent)
- 2,5-Dimethyl-2,5-di(t-butylperoxy)hexane
- HC 4 (peroxide)
- Interox DHBP
- Interox DHBP 45IC/G
- Kayahexa AD
- Kayahexa AD 40
- Kayahexa AD 40C
- Luperco 101X45
- Luperco 101XL
- Luperox 101
- Lupersol 101
- Lupersol 101XL
- Perhexa 25B
- Perhexa 25B40
- Peroxide, (1,1,4,4-tetramethyl-1,4-butanediyl)bis((1,1-dimethylethyl)
- Peroxide, (1,1,4,4-tetramethyltetramethylene)bis(tert-butyl)
- RC 4 (peroxide)
- TC 8 (catalyst)
- Trigonox 101
- Trigonox 101-101/45
- Trigonox XQ 8
- Varox
- Varox 50
- Varox DBPH 50
- Varox Liquid

4 - First Aid Measures

AFTER INHALATION
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

AFTER SKIN CONTACT
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

AFTER EYE CONTACT
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

AFTER INGESTION
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

5 - Fire Fighting Measures

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

SPECIAL RISKS
Specific Hazard(s): Combustible liquid. Emits toxic fumes under fire conditions. May accelerate combustion. Contact with other material may cause fire.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

6 - Accidental Release Measures

PERSONAL PRECAUTION PROCEDURES TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.
METHODS FOR CLEANING UP
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

7 - Handling and Storage

HANDLING
Directions for Safe Handling: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Conditions of Storage: Keep tightly closed. Keep away from combustible materials, heat, sparks, and open flame.
Store at 2-8°C

8 - Exposure Controls / Personal Protection

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Remove and wash contaminated clothing promptly.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory Protection: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand Protection: Compatible chemical-resistant gloves.
Eye Protection: Chemical safety goggles.

9 - Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>BP/BP Range</td>
<td>55.0 - 57.0 °C</td>
<td>7 mmHg</td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Flash Point</td>
<td>65 °C</td>
<td>Method: closed cup</td>
</tr>
<tr>
<td>Flammability</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Autoignition Temp</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Oxidizing Properties</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Explosive Properties</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Explosion Limits</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>SG/Density</td>
<td>0.877 g/cm3</td>
<td></td>
</tr>
<tr>
<td>Partition Coefficient</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Viscosity</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vapor Density</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Saturated Vapor Conc.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Decomposition Temp.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Solvent Content</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
10 - Stability and Reactivity

STABILITY
Stable: Unstable.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

11 - Toxicological Information

RTECS NUMBER: MO1835000

ACUTE TOXICITY

LD50
Oral Rat
> 3200 mg/kg

SIGN AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

12 - Ecological Information

No data available.

13 - Disposal Considerations

SUBSTANCE DISPOSAL
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations.

14 - Transport Information

RID/ADR
UN#: 3105
Class: 5.2
Proper Shipping Name: Organic peroxide type D, liquid

IMDG
UN#: 3105
CLASSIFICATION AND LABELING ACCORDING TO EU DIRECTIVES

INDICATION OF DANGER: O-Xi
Oxidizing. Irritant.
R-PHRASES: 7-36/37/38
May cause fire. Irritating to eyes, respiratory system and skin.
S-PHRASES: 7-14-26-36/37/39-47
Keep container tightly closed. Keep away from combustible material. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. Keep at temperature not exceeding 30°C

COUNTRY SPECIFIC INFORMATION

Germany
WGK: 1
ID-Number: 1456
KBwS-Decision

16 - Other Information

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2008 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

DISCLAIMER
For R&D use only. Not for drug, household or other uses.
1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name : Poly(ethylene glycol)

Product Number : 81190
Brand : Fluka

Company : Sigma-Aldrich Pty. Ltd.
12 Anella Avenue
CASTLE HILL NSW 2154
AUSTRALIA
Telephone : +612984105551800800097
Fax : +612984105001800800096
Emergency Phone # : +44 (0)8701 906777 (1800 448 465)

2. HAZARDS IDENTIFICATION

Not classified as hazardous according to criteria of NOHSC.

Not a hazardous substance or preparation according to EC-directives 67/548/EEC or 1999/45/EC.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : PEG

Formula : (C2H4O)nH2O

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEG 1000</td>
<td>25322-68-3</td>
<td>500-038-2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.
6. ACCIDENTAL RELEASE MEASURES

   Personal precautions
   Avoid dust formation.

   Environmental precautions
   Do not let product enter drains.

   Methods for cleaning up
   Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

   Handling
   Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

   Storage
   Store in cool place. Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

   We are not aware of any national exposure limit.

   Personal protective equipment

      Respiratory protection
      Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

      Hand protection
      For prolonged or repeated contact use protective gloves.

      Eye protection
      Safety glasses

      Hygiene measures
      General industrial hygiene practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

   Appearance
   Form solid

   Safety data
   pH no data available
   Melting point 37 - 40 °C
   Boiling point no data available
   Flash point no data available
   Ignition temperature no data available
   Lower explosion limit no data available
   Upper explosion limit no data available
   Water solubility no data available
10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 32,000 mg/kg
LD50 Dermal - rabbit - > 20,000 mg/kg

Irritation and corrosion
Eyes - rabbit - Mild eye irritation - 24 h

Sensitisation
no data available

Chronic exposure

Carcinogenicity - mouse - Intravaginal
Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Tumorigenic Effects: Other reproductive system tumors.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.

Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.

Ingestion May be harmful if swallowed.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)
no data available

Ecotoxicity effects
no data available

Further information on ecology
no data available

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations.

Contaminated packaging
Dispose of as unused product.
ADR/RID
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

Labelling according to EC Directives

Further information:
The product does not need to be labelled in accordance with EC directives or respective national laws.

16. OTHER INFORMATION

Further information
Copyright 2008 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
Film Characteristics
NatureWorks® PLA (polylactide) polymer 4032D can be converted into a biaxially oriented film with use temperatures up to 300°F (150°C). This film has excellent optics, good machinability and excellent twist and deadfold. These properties make 4032D film an ideal product for laminations and other packaging applications. Additional properties include barrier to flavor and grease and oil resistance.

Polymer Characteristics
PLA polymer is available in pellet form. Drying prior to processing is essential. The polymer is stable in the molten state, provided that the extrusion and drying procedures are followed.

Machine Configuration
PLA polymers will process on conventional extruders. Configure general purpose screws with L/D ratios from 24:1 to 30:1 and compression ratio of 2.5:1 to 3:1. PLA resins will process on conventional cast tenter equipment.

Process Details
Startup and Shutdown
PLA polymer 4032D is not compatible with a wide variety of polyolefin resins, and special purging sequences should be followed:

1. Clean extruder and bring temperatures to steady state with low-viscosity, general-purpose polystyrene or polypropylene.
2. Vacuum out hopper system to avoid contamination.
3. Introduce PLA polymer into the extruder at the operating conditions used in Step 1.
4. Once PLA polymer has purged, reduce barrel temperatures to desired set points.
5. At shutdown, purge machine with high-viscosity polystyrene or polypropylene.

Drying
In-line drying is required. A moisture content of less than 0.025% (250 ppm) is recommended to prevent viscosity degradation. Typical drying conditions are 4 hours at 175°F (80°C) or to a dew point of -30°F (-35°C), with an airflow rate greater than 0.5 cfm/lb of resin throughout. The resin should not be exposed to atmospheric conditions after drying.

<table>
<thead>
<tr>
<th>Processing Temperature Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melt Temperature</td>
</tr>
<tr>
<td>Feed Throat</td>
</tr>
<tr>
<td>Feed Temperature</td>
</tr>
<tr>
<td>Compression Section</td>
</tr>
<tr>
<td>Metering Section</td>
</tr>
<tr>
<td>Adapter</td>
</tr>
<tr>
<td>Die</td>
</tr>
<tr>
<td>Screw Speed</td>
</tr>
<tr>
<td>MD Draw Temp.</td>
</tr>
<tr>
<td>TD Draw Temp.</td>
</tr>
<tr>
<td>Heat Set Oven</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typical Material &amp; Application Properties</th>
<th>Value</th>
<th>ASTM Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Properties</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>1.25 g/cc</td>
<td>D1505</td>
</tr>
<tr>
<td>Tensile Strength MD TD</td>
<td>15 kpsi</td>
<td>D882</td>
</tr>
<tr>
<td>Tensile Modulus MD TD</td>
<td>21 kpsi</td>
<td>D882</td>
</tr>
<tr>
<td>Tensile Modulus MD TD</td>
<td>500 kpsi</td>
<td>D882</td>
</tr>
<tr>
<td>Elongation at Break MD TD</td>
<td>550 kpsi</td>
<td>D882</td>
</tr>
<tr>
<td>Elongation at Break MD TD</td>
<td>180%</td>
<td>D882</td>
</tr>
<tr>
<td>Elongation at Break MD TD</td>
<td>100%</td>
<td>D882</td>
</tr>
<tr>
<td>Elmentorf Tear MD TD</td>
<td>17 g/mil</td>
<td>D1922</td>
</tr>
<tr>
<td>Elmentorf Tear MD TD</td>
<td>14 g/mil</td>
<td>D1922</td>
</tr>
<tr>
<td>Spencer Impact</td>
<td>2.5 joules</td>
<td>D1922</td>
</tr>
<tr>
<td>Transmission Rates Oxygen</td>
<td>550 cc-mil/m²/24 hr atm</td>
<td>D1434</td>
</tr>
<tr>
<td>Transmission Rates Carbon Dioxide</td>
<td>3,000 cc-mil/m²/24 hr atm</td>
<td>D1434</td>
</tr>
<tr>
<td>Transmission Rates Water Vapor</td>
<td>325 g-mil/m²/24 hr atm</td>
<td>E96</td>
</tr>
<tr>
<td>Optical Characteristics Haze</td>
<td>2.1%</td>
<td>D1003</td>
</tr>
<tr>
<td>Optical Characteristics Gloss, 20°</td>
<td>90</td>
<td>D1003</td>
</tr>
<tr>
<td>Thermal Characteristics Glass Transition Temperature</td>
<td>136°F (58°C)</td>
<td>D3418</td>
</tr>
<tr>
<td>Thermal Characteristics Melting Point</td>
<td>320°F (160°C)</td>
<td>D1003</td>
</tr>
</tbody>
</table>

Keep the package sealed until ready to use and promptly reseal any unused material.
Compostability

Composting is a method of waste disposal that allows organic materials to be recycled into a product that can be used as a valuable soil amendment. PLA is made primarily of polyactic acid, a repeating chain of lactic acid, which undergoes a 2-step degradation process. First, the moisture and heat in the compost pile attack the PLA polymer chains and split them apart, creating smaller polymers, and finally, lactic acid. Microorganisms in compost and soil consume the smaller polymer fragments and lactic acid as nutrients. Since lactic acid is widely found in nature, a large number of organisms metabolize lactic acid. At a minimum, fungi and bacteria are involved in PLA degradation. The end result of the process is carbon dioxide, water and also humus, a soil nutrient. This degradation process is temperature and humidity dependent. Regulatory guidelines and standards for composting revolve around four basic criteria: Material Characteristics, Biodegradation, Disintegration, and Ecotoxicity. Description of the requirements of these testing can be found in the appropriate geographical area: DIN V 54900-1 (Germany), EN 13432 (EU), ASTM D 6400 (USA), GreenPla (Japan). This grade of NatureWorks® PLA meets the requirements of these four standards with limitation of maximum layer thickness of 1650 μm and for coating layers up to 37 μm thick.

FDA Status

U.S. Status

This is to advise you that on January 3, 2002 FCN 000178 submitted by NatureWorks LLC to FDA became effective. This effective notification is part of list currently maintained on FDA’s website at http://www.cfsan.fda.gov/~dms/opa-fcn.html. This grade of NatureWorks® PLA may therefore be used in food packaging materials and, as such, is a permitted component of such materials pursuant to section 201(s) of the Federal, Drug, and Cosmetic Act, and Parts 182, 184, and 186 of the Food Additive Regulations. All additives and adjuncts contained in the referenced NatureWorks® PLA formulation meet the applicable sections of the Federal Food, Drug, and Cosmetic Act. The finished polymer is approved for all food types and B-H use conditions. We urge all of our customers to perform GMP (Good Manufacturing Procedures) when constructing a package so that it is suitable for the end use. Again, for any application, should you need further clarification, please do not hesitate to contact NatureWorks LLC.

European Status

This grade of NatureWorks® PLA complies with Commission Directive 2002/72/EC as amended by 2004/19/EC. No SML’s for the above referenced grade exist in Commission Directive 2002/72/EC or as amended by 2004/19/EC. NatureWorks LLC would like to draw your attention to the fact that the EU-Directive 2002/72/EC, which applies to all EU-Member States, includes a limit of 10 mg/dm² of the overall migration from finished plastic articles into food. In accordance with EU-Directive 2002/72/EC the migration should be measured on finished articles placed into contact with the foodstuff or appropriate food simulants for a period and at a temperature which are chosen by reference to the contact conditions in actual use, according to the rules laid down in EU-Directives 93/8/EEC (amending 82/711/EEC) and 85/572/EEC. Please note that it is the responsibility of both the manufacturers of finished food contact articles as well as the industrial food packers to make sure that these articles in their actual use are in compliance with the imposed specific and overall migration requirements. This grade as supplied meets European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste heavy metal content as described in Article 11. It is recoverable in the form of material recycling, energy recovery, composting, and biodegradable per Annex II point 3, subject to the standards of the local community. Again, for any application, should you need further clarification, please do not hesitate to contact NatureWorks LLC.

Bulk Storage Recommendations

The resin silos recommended and used by NatureWorks LLC are designed to maintain dry air in the silo and to be isolated from the outside air. This design would be in contrast to an open, vented to atmosphere system that we understand to be a typical polystyrene resin silo. Key features that are added to a typical (example: polystyrene) resin silo to achieve this objective include a cyclone and rotary valve loading system and some pressure vessel relief valves. The dry air put to the system is sized to the resin flow rate out of the silo. Not too much dry air would be needed and there may be excess instrument air (-30°F dew point) available in the plant to meet the needs for dry air. Our estimate is 10 scfm for a 20,000 lb/hr rate resin usage. Typically, resin manufacturers specify aluminum or stainless steel silos for their own use and avoid epoxy-lined steel.
PLA polymers have a very low degree of toxicity and, under normal conditions of use, should pose no unusual problems from incidental ingestion, or eye and skin contact. However, caution is advised when handling, storing, using, or disposing of these resins, and good housekeeping and controlling of dusts are necessary for safe handling of product. Workers should be protected from the possibility of contact with molten resin during fabrication. Handling and fabrication of resins can result in the generation of vapors and dusts that may cause irritation to eyes and the upper respiratory tract. In dusty atmospheres, use an approved dust respirator. Pellets or beads may present a slipping hazard. Good general ventilation of the polymer processing area is recommended. At temperatures exceeding the polymer melt temperature (typically 170ºC), polymer can release fumes, which may contain fragments of the polymer, creating a potential to irritate eyes and mucous membranes. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation is recommended for melt operations. Use safety glasses if there is a potential for exposure to particles which could cause mechanical injury to the eye. If vapor exposure causes eye discomfort, use a full-face respirator. No other precautions other than clean, body-covering clothing should be needed for handling PLA polymers. Use gloves with insulation for thermal protection when exposure to the melt is localized.

Combustibility
PLA polymers will burn. Clear to white smoke is produced when product burns. Toxic fumes are released under conditions of incomplete combustion. Do not permit dust to accumulate. Dust layers can be ignited by spontaneous combustion or other ignition sources. When suspended in air, dust can pose an explosion hazard. Firefighters should wear positive-pressure, self-contained breathing apparatuses and full protective equipment. Water or water fog is the preferred extinguishing medium. Foam, alcohol-resistant foam, carbon dioxide or dry chemicals may also be used. Soak thoroughly with water to cool and prevent re-ignition.

Disposal
DO NOT DUMP INTO ANY SEwers, ON THE GROUND, OR INTO ANY BODY OF WATER. For unused or uncontaminated material, the preferred options include recycling into the process or sending to an industrial composting facility, if available; otherwise, send to an incinerator or other thermal destruction device. For used or contaminated material, the disposal options remain the same, although additional evaluation is required. (For example, in the U.S.A., see 40 CFR, Part 261, "Identification and Listing of Hazardous Waste.") All disposal methods must be in compliance with Federal, State/Provincial, and local laws and regulations.

Environmental Concerns
Generally speaking, lost pellets are not a problem in the environment except under unusual circumstances when they enter the marine environment. They are benign in terms of their physical environmental impact, but if ingested by waterfowl or aquatic life, they may mechanically cause adverse effects. Spills should be minimized, and they should be cleaned up when they happen. Plastics should not be discarded into the ocean or any other body of water.

Product Stewardship
NatureWorks LLC has a fundamental duty to all those that make and use our products, and for the environment in which we live. This duty is the basis for our Product Stewardship philosophy, by which we assess the health and environmental information on our products and their intended use, then take appropriate steps to protect the environment and the health of our employees and the public.

Customer Notice
NatureWorks LLC encourages its customers and potential users of its products to review their applications for such products from the standpoint of human health and environmental quality. To help ensure our products are not used in ways for which they were not intended or tested, our personnel will assist customers in dealing with ecological and product safety considerations. Your sales representative can arrange the proper contacts. NatureWorks LLC literature, including Material Safety Data sheets, should be consulted prior to the use of the company’s products. These are available from your NatureWorks LLC representative.

Notice: No freedom from any patent owned by NatureWorks LLC or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer’s use and for ensuring that Customer’s workplace and disposal practices are in compliance with applicable laws and other governmental enactments. NatureWorks LLC assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE ARE EXPRESSLY EXCLUDED.

Notice Regarding Prohibited Use Restrictions: NatureWorks does not recommend any of its products, including samples, for use as: Components of or, packaging for, tobacco products; Components of products where the end product is intended for human or animal consumption; In any application that is intended for any internal contact with human body fluids or body tissues; As a critical component in any medical device that supports or sustains human life; In any product that is designed specifically for ingestion or internal use by pregnant women; and in any application specifically designed to promote or interfere with human reproduction.

For additional information in the U.S. and Canada, call toll-free 1-877-423-7659
In Europe, call 31-(0)35-699-1344
In Japan, call 81-33-285-0824

NatureWorks and the NatureWorks logo are trademarks of NatureWorks LLC
Copyright © 2005 NatureWorks LLC