Material Safety Data Sheet
LA0938
2,4-Pentanedione

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Id: LA0938
Product Name: 2,4-Pentanedione
Synonyms: ACETOACETONE; DIACETYMETHANE; 2,4-DIOXOPENTANE; 2,4-PENTADIONE; Pentan-2,4-dione; 2,4-PENTANEDIONE; 2-PROPANONE, ACETYL-
Chemical Family: None Known
Application: Used in polyolefin manufacturing.

Distributed By:
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC
V6X 1W5

Prepared By: The Safety, Health and Environment Department of Univar Canada Ltd.
Preparation date of MSDS: 01 April 2011
Telephone number of preparer: 1-866-686-4827

24-Hour Emergency Telephone Number (CANUTEC): (613) 996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Percentage (W/W)</th>
<th>LD50s and LC50s Route &amp; Species:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane-2,4-dione</td>
<td>100</td>
<td>Inhalation LC50 (Rat) = 1224 ppm 4 h</td>
</tr>
<tr>
<td>123-54-6</td>
<td></td>
<td>Oral LD50 (Rat) = 55 mg/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dermal LD50 (Rabbit) = 810 µL/kg</td>
</tr>
</tbody>
</table>

Note: No additional remark.

3. HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Eye Contact: Causes severe eye irritation. Symptoms include pain, redness and tearing. May cause conjunctivitis and swelling. May cause corneal injury.
Skin Contact: Toxic by skin contact. Causes skin irritation. May cause cyanosis of the extremities. May cause dermatitis.
Inhalation: Toxic if inhaled. Material is irritating to mucous membranes and upper respiratory tract. Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. Inhalation of high vapour concentrations may cause central nervous system depression resulting in dizziness, light headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. Aspiration may cause pulmonary edema.
3. HAZARDS IDENTIFICATION

Ingestion: Toxic by oral exposure. May cause digestive tract irritation. May cause abdominal discomfort, nausea, vomiting and diarrhea. Dizziness and drowsiness may occur. May cause central nervous system effects, such as headache, nausea, vomiting, abdominal pain, dizziness, confusion and breathing difficulties.

4. FIRST AID MEASURES

Eye Contact: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.
Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.
Inhalation: Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.
Ingestion: Do NOT induce vomiting. Never give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.

Notes to Physician: There is no specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. In case of massive exposure, victim should be observed for several days for delayed effects. 2,4-Pentanediol is of moderately high acute peroral and percutaneous toxicity, a mild to moderate skin irritant, and a mild eye irritant. Recurrent exposures to high concentrations of 2,4-pentanediol vapor (c. 650 ppm) produce lethal degenerative lesions in the central nervous system and thymus of laboratory animals. Adverse effects from repeated exposure to high concentrations may be due to induced Vitamin B deficiencies.

5. FIRE FIGHTING MEASURES

Flash Point: 35 °C / 96 °F
Flash Point Method: Tag Closed Cup
Autoignition Temperature: Not Available.
Flammable Limits in Air (%): Lower: 1.7% Upper: 11.4%
Extinguishing Media: Use DRY chemicals, CO2, alcohol foam or water spray.
Special Exposure Hazards: Use water spray to cool fire-exposed containers and structures. Vapors from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point. Static ignition hazard can result from handling and use. Electrically bond and ground all containers, personnel and equipment before transfer or use of material. Special precautions may be necessary to dissipate static electricity for non-conductive containers. Use proper bonding and grounding during product transfer. Avoid accumulation of water. Product may be carried across water surface spreading fire or contacting an ignition source.
Special Protective Equipment: Fire fighters should wear full protective clothing, including self-contained breathing equipment.

NFPA RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 3, INSTABILITY 0
HMIS RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 3, REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Keep personnel out of low areas. Keep upwind of spill. Ventilate area of leak or spill. No smoking in area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. For large spills, warn public of downwind explosion hazard. Check area with combustible gas detector before reentering area. Use appropriate safety equipment.
Environmental Precautionary Measures: Prevent contamination of soil. Prevent entry into sewers or streams, dike if needed. Consult local authorities.
Procedure for Clean Up: Contain spilled material if possible. Handling equipment must be grounded. If available, use foam to smother or suppress vapors. Pump with explosion-proof equipment. Collect in suitable and properly labeled containers.
7. HANDLING AND STORAGE

Handling: Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Avoid breathing vapor. Do not ingest. Wash thoroughly after handling. Keep the containers closed when not in use. Use with adequate ventilation. Never use air pressure for transferring product. No smoking or open flame in storage, use or handling areas. Vapours may accumulate and travel to distant ignition sources and flashback. Bond and ground containers during transfer operations. Empty containers may contain hazardous product residues. Do not cut, drill, grind, weld or perform similar operations on or near containers.

Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Store product below 26.6°C (80°F). Do not dispense or transfer above 26.6°C (80°F). Store in accordance with good industrial practices.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:
General (mechanical) room ventilation is expected to be satisfactory where this product is stored and handled in closed equipment. Special, local ventilation is needed at points where vapor can be expected to escape to the workplace air.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator. In case of spill or leak resulting in unknown concentration, use a NIOSH approved supplied air respirator.

Gloves:
Butyl rubber gloves.

Skin Protection: Chemical apron.

Eyes: Chemical goggles; also wear a face shield if splashing hazard exists.

Other Personal Protection Data: Ensure that eyewash stations and safety showers are proximal to the work-station location.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Exposure Limit - ACGIH</th>
<th>Exposure Limit - OSHA</th>
<th>Immediately Dangerous to Life or Health - IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane-2,4-dione</td>
<td>Not available.</td>
<td>Not available.</td>
<td>Not Available.</td>
</tr>
</tbody>
</table>

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid.
Colour: Colourless - White
Odour: Obnoxious.

Specific Gravity: 0.97

Boiling Point: 140°C / 285°F

Freezing/Melting Point: -23°C / -9°F

Vapour Pressure: 6.8 mmHg @ 20°C

Vapour Density: 3.5

% Volatile by Volume: Not Available.

Evaporation Rate: 0.75

Solubility: Soluble in water.

VOCs: Not Available.

Viscosity: Not Available.

Molecular Weight: 100 g/mol

Other: Not Available.

10. STABILITY AND REACTIVITY

Chemical Stability: Stable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: Under oxidation conditions, peroxides may be formed. If they become concentrated, these peroxides may present an explosion hazard.

Materials to Avoid: Strong mineral acids. Strong oxidizing agents such as concentrated nitric acid, oxygen or ozone, and perchloric acid.


Additional Information:
No additional remark.
11. TOXICOLOGICAL INFORMATION

**Principle Routes of Exposure**

**Ingestion:** Toxic by oral exposure. May cause digestive tract irritation. May cause abdominal discomfort, nausea, vomiting and diarrhea. Dizziness and drowsiness may occur. May cause central nervous system effects, such as headache, nausea, vomiting, abdominal pain, dizziness, confusion and breathing difficulties.

**Skin Contact:** Toxic by skin contact. Causes skin irritation. May cause cyanosis of the extremities. May cause dermatitis.

**Inhalation:** Toxic if inhaled. Material is irritating to mucous membranes and upper respiratory tract. Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. Inhalation of high vapour concentrations may cause central nervous system depression resulting in dizziness, light headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. Aspiration may cause pulmonary edema.

**Eye Contact:** Causes severe eye irritation. Symptoms include pain, redness and tearing. May cause conjunctivitis and swelling. May cause corneal injury.

**Additional Information:** Repeated exposure to concentrations of 2,4-pentanedione greater than 200 ppm may result in nasal mucosal inflammation. Higher concentrations (>300-400 ppm) may produce more serious adverse effects. Animal studies suggest that the central nervous system, immune system, and bone marrow may be involved.

**Acute Test of Product:**
- **Acute Oral LD50:** Not Available.
- **Acute Dermal LD50:** Not Available.
- **Acute Inhalation LC50:** Not Available.

**Carcinogenicity:**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>IARC - Carcinogens</th>
<th>ACGIH - Carcinogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane-2,4-dione</td>
<td>Not listed.</td>
<td>Not listed.</td>
</tr>
</tbody>
</table>

**Carcinogenicity Comment:** No additional information available.

**Reproductive Toxicity/ Teratogenicity/ Embryotoxicity/ Mutagenicity:** A subchronic inhalation toxicology study conducted with vapor from 2,4-pentanedione, resulted in the following effects. At 650 ppm there were marked signs of toxicity with deaths; body weight decreases; decreased erythrocyte count and hematocrit; degenerative changes in the brain and thymus of animals that died; reversible squamous metaplasia in nasal mucosae. At 300 ppm: slight decrease in body weight; decreased erythrocyte count and hematocrit; no histopathological features. At 100 ppm: no adverse effects observed compared with non-exposed controls. Exposure of pregnant Fischer 344 rats to 2,4-pentanedione vapor at 50, 200 or 400 ppm during the period of organogenesis resulted in maternal toxicity at 400 ppm (decreased body weight). Fetotoxicity was seen at 400 ppm (reduced fetal body weight). Embryotoxic and teratogenic effects were not seen at any exposure concentration. 2,4-Pentanedione did not produce mutagenic events in a bacterial (Ames) test and an in vitro CHO forward gene mutation test (HGPRT locus). Positive effects were noted in vitro with CHO sister chromatid exchange and chromosome aberration tests. While 2,4-pentanedione induced micronuclei in vivo in a mouse micronucleus test using the intraperitoneal route of exposure, no micronuclei were induced in either rats or mice by vapor exposure up to 592 ppm (6 hr/day for 5 days). Also, chromosome aberrations were not seen in rat bone marrow following vapor exposure up to 695 ppm, or mouse bone marrow with exposures up to 590 ppm (6 hr/day for 5 consecutive days). The significance of these findings with respect to long-term human health are uncertain, but they do indicate an absence of genotoxic effects in vivo by vapor exposure. In an ongoing 9-day repeated occluded skin contact study in the rat there was evidence for central neurotoxic effects at 2,4-pentanedione applied dosages of 975 and 1463 mg/kg/day, but not at 244 mg/kg/day.

LA0938
2,4-Pentanedione
Page 4 of 7
12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Ecotoxicity - Fish Species Data</th>
<th>Acute Crustaceans Toxicity:</th>
<th>Ecotoxicity - Freshwater Algae Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane-2,4-dione</td>
<td>LC50 96 h (Pimephales promelas) 98.3-110 mg/L flow-through</td>
<td>Not Available.</td>
<td>Not Available.</td>
</tr>
<tr>
<td></td>
<td>LC50 96 h (Lepomis macrochirus) 50.3-71.8 mg/L flow-through</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC50 96 h (Oncorhynchus mykiss) 64.1-80.1 mg/L flow-through</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LC50 96 h (Pimephales promelas) 98.3-110 mg/L flow-through</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Information:
No additional remark.

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.

Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):
DOT Shipping Name: PENTANE-2,4-DIONE
DOT Hazardous Class 3 (6.1)
DOT UN Number: UN2310
DOT Packing Group: III
DOT Reportable Quantity (lbs): Not Available.
Note: No additional remark.
Marine Pollutant: No.

TDG (Canada):
TDG Shipping Name: PENTANE-2,4-DIONE
Hazard Class: 3 (6.1)
UN Number: UN2310
Packing Group: III
Note: No additional remark.
Marine Pollutant: No.
15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on the Toxic Substances Control Act (TSCA) Inventory List or exempt.

Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

Note: Not available.

U.S. Regulatory Rules

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>CERCLA/SARA - Section 302:</th>
<th>SARA (311, 312) Hazard Class:</th>
<th>CERCLA/SARA - Section 313:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane-2,4-dione</td>
<td>Not Listed.</td>
<td>Not Listed.</td>
<td>Not Listed.</td>
</tr>
</tbody>
</table>

California Proposition 65: Not Listed.
MA Right to Know List: Listed.
New Jersey Right-to-Know List: Listed.
Pennsylvania Right to Know List: Listed.

WHMIS Hazardous Class:
B2  FLAMMABLE LIQUIDS
D1B  TOXIC MATERIALS
D2B  TOXIC MATERIALS
16. OTHER INFORMATION

Additional Information:
This product has been classified in accordance with the hazard criteria of the
Canadian Controlled Products Regulations (CPR) and the MSDS contains all the
information required by the CPR.

Disclaimer:
NOTICE TO READER:
Univar, expressly disclaims all express or implied warranties of merchantability and
fitness for a particular purpose, with respect to the product or information provided
herein, and shall under no circumstances be liable for incidental or consequential
damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a
product specification. For product specification information refer to a Product
Specification Sheet and/or a Certificate of Analysis. These can be obtained from your
local Univar Sales Office.

All information appearing herein is based upon data obtained from the manufacturer
and/or recognized technical sources. While the information is believed to be accurate,
Univar makes no representations as to its accuracy or sufficiency. Conditions of use
are beyond Univar's control and therefore users are responsible to verify this data
under their own operating conditions to determine whether the product is suitable for
their particular purposes and they assume all risks of their use, handling, and disposal
of the product, or from the publication or use of, or reliance upon, information
contained herein. This information relates only to the product designated herein, and
does not relate to its use in combination with any other material or in any other
process.

***END OF MSDS***