Material Safety Data Sheet

City University of Hong Kong

MSDS                          DIOXANE  0295

PRODUCT INFORMATION

Product Name: Dioxane
Chinese Name: 二噁烷, 二氧雜環己烷
Chemical Name: 1,4-Dioxane
Chemical Family: Ethers
Formula: C₄H₈O₂
Synonyms: Diethylene Ether; Diethylene Oxide; 1,4-Diethylene P-Dioxane
Use: Used In Shampoo Formulations.
CAS Number: 123-91-1
CAS Name: 1,4-Dioxane

RISK SYMBOL

FLAMMABLE
易燃

HARMFUL
有害
PHYSICAL DATA

Boiling Point, deg. C at 760 mm Hg : 101.3
Freezing Point, deg. C : 11.8
Specific Gravity (H₂O = 1) : 1.034 at 20/20 deg. C
Vapour Pressure At 20 deg. C : 27 mmHg
Vapour Density (Air = 1) : 3.0
Solubility In Water, % By Weight : 100
% Volatiles By Volume : > Or = 99.5
Evaporation Rate (Butyl Acetate = 1) : 2.7
Appearance And Odour : Clear liquid; ether-like odour.

FIRE AND EXPLOSION DATA

Flash Point :
   12 deg. C, Tag closed cup, ASTM D 56.
   23 deg. C, Tag open cup, ASTM D 1310.

Flammable Limits In Air, % By Volume
   Upper: 22%           Lower: 2%

Extinguishing Media :
Use alcohol-type or universal-type foams applied by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical for small fires.

Special Fire Fighting Procedures :
Use water spray to cool fire-exposed containers and structures. Use self-contained breathing apparatus and protective clothing.

Unusual Fire And Explosion Hazards :
Dioxane is prone to formation of peroxides. Vapours formed from the product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. 1,4-dioxane vapours may settle in low or confined areas, or travel a long distance to an ignition source and flash back explosively.

REACTIVITY DATA

Stability: Stable
Conditions To Avoid:
Storage under air will result in peroxide formation. See Section XI "OTHER PRECAUTIONS".

Incompatibility: Strong oxidizing agents
Hazardous Combustion Or Decomposition Products:
Burning can produce carbon monoxide and/or carbon dioxide.

Hazardous Polymerization: Will not occur
Conditions To Avoid: None currently known

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HEALTH HAZARD DATA
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Exposure limits:

<table>
<thead>
<tr>
<th>Exposure limits</th>
<th>TWA-skin</th>
<th>ACGIH (1990-91)</th>
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</thead>
<tbody>
<tr>
<td>25 ppm</td>
<td>not contact</td>
<td>skin or oral, Union Carbide</td>
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<tr>
<td>25 ppm</td>
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LC₅₀: 46 g/m³/2h  inhalation-rat  RTECS (1990)
LD₅₀: 7120 mg/kg  oral-rat  Union Carbide
7600 mg/kg  skin-rabbit  RTECS (1990)
7858 mg/kg  skin-rabbit  Union Carbide

Swallowing:
Moderately toxic. May cause nausea, abdominal discomfort, vomiting, and diarrhea. May cause kidney and liver damage.

Skin Absorption:
Prolonged or widespread contact may result in the absorption of potentially harmful amounts of material.

Inhalation:
Vapours may cause irritation of the eyes, nose, and throat with headache, nausea, vomiting, dizziness, drowsiness, and stomach pain. May result in kidney and liver damage.

Skin Contact: May cause slight irritation with slight discomfort and transient local Redness.
Eye Contact:
Causes irritation, experienced as discomfort, with excess blinking and tear production, and seen as excess redness and swelling of the conjunctiva.

Effects Of Repeated Overexposure:
May cause liver and kidney damage. Repeated skin contact may result in the development of a cumulative dermatitis.
Other Effects Of Overexposure: None currently known
Medical Conditions Aggravated By Overexposure:
Breathing of vapour and/or mist may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its defatting properties, this material may aggravate an existing dermatitis. Significant laboratory data with possible relevance to human health hazard

Evaluation:
1,4-Dioxane has been shown to cause cancer in laboratory animals; the relevance to humans of these test results is not known. 1,4-Dioxane is on the IARC and NTP list of carcinogens.

FIRST AID MEASURES

Swallowing:
If patient is conscious and has a gag reflex, give 2 glasses of water and induce vomiting. Call a physician.

Skin:
Remove contaminated clothing and wash skin with soap and water. Wash clothing before reuse. Call a physician.

Inhalation:
Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Call a physician.

Eyes: Immediately flush eyes thoroughly with water for several minutes. Call a physician.

Notes To Physician:
There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

PREVENTATIVE MEASURES

Respiratory Protection:
NIOSH or MSHA approved self-contained breathing apparatus in high vapour concentrations.

Ventilation:
This product should be confined within closed equipment, in which case general (mechanical) room ventilation is expected to be satisfactory. Special, local ventilation is needed at points where vapours can be expected to escape to the workplace air.

Protective Gloves: Butyl
Eye Protection: Monogoggles/face shield
Other Protective Equipment: Eye bath, safety shower, and chemical apron.

Precautions To Be Taken In Handling And Storing:
WARNING! Flammable
- Harmful if inhaled.
- Harmful if absorbed through skin.
- Causes eye and skin irritation.
- May form explosive peroxides.
- Causes cancer in laboratory animals.
- May cause liver and kidney damage.
- May cause dizziness and drowsiness.

Keep away from heat, sparks, and flame.
- Avoid breathing vapour.
- Avoid contact with eyes, skin, and clothing.
- Keep container closed.
- Maintain under inert atmosphere.
- Use with adequate ventilation.
- Wash thoroughly after handling.

Vapours formed from this product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point.

Other Precautions:
Autoignition:
- Dioxane has a relatively low autoignition temperature (180 deg. C) compared to other flammable liquids.

Peroxides:
Dioxane forms peroxides. Experience indicates these are not hazardous in a dilute solution in dioxane. However, they are considered to be potentially hazardous if concentrated. Peroxide formation can be minimized by storing dioxane under a nitrogen atmosphere. Use proper bonding and grounding during liquid transfer as described in the national fire protection association, document NFPA 77. 1,4-dioxane vapours may settle in low or confined areas, or travel a long distance to an ignition source and flash back explosively.

Warning! Hot organic chemical vapours or mists are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below those published in the literature as "autoignition" or "ignition" temperatures. Ignition temperatures decrease with increasing vapour volume and vapour/air contact time, and are influenced by pressure changes. Ignition may occur at typical elevated-temperature process conditions, especially in processes operating under vacuum if subjected to sudden ingress of air, or outside process equipment operating under elevated pressure if sudden escape of vapours or mists to the atmosphere occurs. Any proposed use of this product in elevated-temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained.
ENVIRONMENTAL PROTECTION DATA

Spill:
Eliminate all sources of ignition. Wear suitable protective equipment. Avoid contact with liquid and vapours. Prevent runoff. Collect for disposal. Observe governmental regulations. Extinguish and do not turn on any ignition source until the area is determined to be free from explosion or fire hazards. Dioxane is resistant to biodegradation; avoid discharge to sewers or waterways.