Material Safety data sheet (MSDS) - Tetrahydrofuran

1. Substance/preparation and company identification

Material: Tetrahydrofuran
Use: Chemical used in synthesis and/or formulation of industrial products

COMPANY IDENTIFICATION

Supplier: Pon Pure Chemicals Group
CHENNAI, TAMILNADU, INDIA

24 Hour Health Emergency
(91) 8939878447
(91) 9444038694

Transportation Emergency Phone
(91) 8939768680

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Place</th>
<th>EMERGENCY TELEPHONE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pon Pure Chemicals Group</td>
<td>India</td>
<td>Day Emergency – 044-26161803-26161809</td>
</tr>
</tbody>
</table>

2. Composition/information on ingredients

Chemical nature
Tetrahydrofuran
CAS Number: 109-99-9
EC-Number: 203-726-8 INDEX-

Hazardous ingredients
Tetrahydrofuran Content (W/W): 99 % - 100 % CAS Number: 109-99-9 EC-Number: 203-726-8 INDEX-Number: 603-025-00-0 Hazard symbol(s): F, Xn
R-phrase(s): 11, 19, 40, 36/37, 22, 67
The wording of the hazard symbols and R-phrases is specified in section 16 if dangerous ingredients are mentioned.

3. Hazard identification

Highly flammable.
May form explosive peroxides.
Irritating to eyes and respiratory system.
Harmful if swallowed.
Limited evidence of a carcinogenic effect.
Vapours may cause drowsiness and dizziness.

4. First-Aid Measures

**General advice:**
Immediately remove contaminated clothing. If danger of loss of consciousness, place patient in recovery position and transport accordingly. Apply artificial respiration if necessary. First aid personnel should pay attention to their own safety.

**If inhaled:**
Keep patient calm, remove to fresh air, seek medical attention.

**On skin contact:**
Wash thoroughly with soap and water.

**On contact with eyes:**
Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

**On ingestion:**
Rinse mouth and then drink plenty of water.

**Note to physician:**
Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms are possible.

**Treatment:** Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

**Suitable extinguishing media:**
Water spray, dry powder, foam, carbon dioxide

**Specific hazards:**
Carbon oxides, nitrogen oxides. The substances/groups of substances mentioned can be released in case of fire.

**Special protective equipment:**
Wear self-contained breathing apparatus and chemical-protective clothing.

**Further information:**
Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems.
6. Accidental Release Measures

**Personal precautions:**
Breathing protection required. Vapours are heavy and collect in low areas.

**Environmental precautions:**
Do not empty into drains.
Methods for cleaning up or taking up: For large amounts: Pump off product.
For residues: Pick up with suitable absorbent material (e.g. sand, sawdust, general-purpose binder, kieselguhr). Dispose of absorbed material in accordance with regulations.

7. Handling and Storage

**Handling**
Prevent contact with air/oxygen (formation of peroxide). Handle under dry inert gas.
Ensure thorough ventilation of stores and work areas. Handle in accordance with good industrial hygiene and safety practice. Remove contaminated clothing and protective equipment before entering eating areas. Hands and/or face should be washed before breaks and at the end of the shift. When using do not eat, drink or smoke.

**Protection against fire and explosion:**
Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy.

**Storage**
Further information on storage conditions: Keep container tightly closed. Keep under nitrogen.

**Storage stability:**
Storage duration: 12 Months
The product is stabilized, the shelf life should be noted.
From the data on storage duration in this safety data sheet no agreed statement regarding the warrantee of application properties can be deduced.

**Additives:**
2,6-di-tert-butyl-p-resol (CAS Number: 128-37-0)

8. Exposure controls and personal protection

**Components with occupational exposure limits**
Tetrahydrofuran, 109-99-9;

TWA value 50 ppm (ACGIHTLV) STEL value 100 ppm (ACGIHTLV) Skin Designation (ACGIHTLV)
The substance can be absorbed through the skin.

Personal protective equipment
Respiratory protection:
Respiratory protection in case of vapour/aerosol release. Gas filter for gases/vapours of organic compounds (boiling point >65 °C, e.g. EN 14387 Type A)

Hand protection:
Chemical resistant protective gloves (EN 374)
Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):
Polyethylene-Laminate (PE laminate) - ca. 0.1 mm coating thickness
Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Eye protection:
Tightly fitting safety goggles (cage goggles) (e.g. EN 166) and face shield.

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Avoid contact with the skin, eyes and clothing. Do not inhale gases/vapours/aerosols. When using, do not eat, drink or smoke. Hands and/or face should be washed before breaks and at the end of the shift. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.
## 9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>Colourless</td>
</tr>
<tr>
<td>Odour</td>
<td>of acetone</td>
</tr>
<tr>
<td>Melting point</td>
<td>-108.5 °C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>65.5 - 66.5 °C</td>
</tr>
<tr>
<td>Flash point</td>
<td>-22 °C</td>
</tr>
<tr>
<td>Flammability</td>
<td>Highly flammable.</td>
</tr>
<tr>
<td>Lower explosion limit</td>
<td>2.3 % (V) (air) (-19.0 °C)</td>
</tr>
<tr>
<td>Upper Explosive Limit</td>
<td>For liquids not relevant for classification and labelling.</td>
</tr>
<tr>
<td>Ignition temperature</td>
<td>230 °C (DIN 51794)</td>
</tr>
<tr>
<td>Self ignition</td>
<td>Based on its structural properties the product is not classified as self-igniting.</td>
</tr>
<tr>
<td>Self heating ability</td>
<td>It is not a substance capable of spontaneous heating.</td>
</tr>
<tr>
<td>Explosion hazard</td>
<td>Based on the chemical structure there is no indicating of explosive properties.</td>
</tr>
<tr>
<td>Fire promoting properties</td>
<td>not fire-propagating</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>173 mbar (20 °C) 586 mbar (50 °C)</td>
</tr>
<tr>
<td>Density</td>
<td>0.887 g/cm³ (20.0 °C) 0.8905 g/cm³ (15 °C) (15 °C) 0.8526 g/cm³ (50 °C)</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.883 (20 °C)</td>
</tr>
<tr>
<td>Bulk density</td>
<td>No data available.</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>miscible, Literature data. (25 °C)</td>
</tr>
<tr>
<td>Solubility (qualitative) solvent(s)</td>
<td>organic solvents miscible</td>
</tr>
<tr>
<td>Partitioning coefficient n-octanol/water (log Pow)</td>
<td>0.45 (25 °C)</td>
</tr>
</tbody>
</table>
Surface tension: Based on chemical structure, surface activity is not to be expected. 
Viscosity, dynamic: 0.456 mPa.s Literature data. 0.359 mPa.s(50 °C) Literature data. 
Molar mass: 72.11 g/mol 

10. Stability and Reactivity 
Conditions to avoid: 
Avoid all sources of ignition: heat, sparks, open flame. Avoid electro-static charge. 
Thermal decomposition: 110 °C, 20 kJ/kg 
It is not a self-decompositionable substance. 
Thermal decomposition: 400 °C 
No exothermic decomposition within the mentioned temperature range. 
Substances to avoid: Strong oxidizing agents 
Corrosion to metals: No corrosive effect on metal. 
Hazardous reactions: Evolution of peroxides. 
No hazardous decomposition products if stored and handled as prescribed/indicated. 

11. Toxicological Information 
Acute toxicity 
Assessment of acute toxicity: 
Of moderate toxicity after single ingestion. Virtually nontoxic by inhalation. 
Virtually nontoxic after a single skin contact. High concentrations in the air may cause narcosis. The substance can be absorbed through the skin. 
LD50 rat (oral): 1,650 mg/kg 
LC50 rat (by inhalation): > 14.7 mg/l 6 h 
The vapour was tested. 
LD50 rat (dermal): > 2,000 mg/kg (OECD Guideline 402) 
Irritation 
Assessment of irritating effects: 
Not irritating to the skin. May cause severe damage to the eyes. Causes temporary irritation of the respiratory tract. 
Primary skin irritation rabbit: non-irritant (Draize test) 
Primary irritations of the mucous membrane rabbit: Risk of serious damage to eyes.
Assessment other acute effects
Causes temporary irritation of the respiratory tract. Possible narcotic effects (drowsiness or dizziness).

Sensitization
Assessment of sensitization:
Skin sensitizing effects were not observed in animal studies.
Mouse Local Lymph Node Assay (LLNA) mouse: Non-sensitizing. (OECD Guideline 429)

Repeated dose toxicity
Assessment of repeated dose toxicity:
No substance-specific organotoxicity was observed after repeated administration to animals.

Genetic toxicity
Assessment of mutagenicity:
Results from a number of mutagenicity studies with microorganisms, mammalian cell culture and mammals are available. Taking into account all of the information, there is no indication that the substance is mutagenic.

Carcinogenicity
Assessment of carcinogenicity:
In long-term studies in rodents exposed to high doses, a tumorigenic effect was found; however, these results are thought to be due to a rodent-specific liver effect that is not relevant to humans. The observed kidney tumors in rats are regarded as a consequence of a species-specific mechanism and thus not relevant for man.

Reproductive toxicity
Assessment of reproduction toxicity:
The results of animal studies gave no indication of a fertility impairing effect.

Developmental toxicity
Assessment of teratogenicity:
Animal studies gave no indication of a developmental toxic effect at doses that were not toxic to the parental animals.
12. Ecological Information

Ecotoxicity

Assessment of aquatic toxicity:
There is a high probability that the product is not acutely harmful to aquatic organisms. The inhibition of the degradation activity of activated sludge is not anticipated when introduced to biological treatment plants in appropriate low concentrations.

Toxicity to fish:
LC50 (96 h) 2,160 mg/l, Pimephales promelas (Fish test acute, Flow through.)
The statement of the toxic effect relates to the analytically determined concentration. Literature data.

Aquatic invertebrates:
EC50 (48 h) 3,485 mg/l, Daphnia magna (Daphnia test acute)
Nominal concentration. Literature data.

Aquatic plants:
Toxic limit concentration (8 d) 3,700 mg/l (growth rate), Scenedesmus sp. (DIN 38412 Part 9, static) The details of the toxic effect relate to the nominal concentration. Literature data.

Microorganisms/Effect on activated sludge:
EC20 (0.5 h) approx. 800 mg/l, activated sludge, domestic (OECD Guideline 209, aquatic) The details of the toxic effect relate to the nominal concentration.

Toxic limit concentration (3 h) 460 mg/l, activated sludge, domestic (OECD Guideline 209, aquatic)

Chronic toxicity to fish:
No observed effect concentration (33 d) 216 mg/l, Pimephales promelas (Flow through.)
The statement of the toxic effect relates to the analytically determined concentration. Literature data.

Chronic toxicity to aquatic invertebrates:
Study scientifically not justified.

Assessment of terrestrial toxicity:

Mobility
Assessment transport between environmental compartments:
The substance will slowly evaporate into the atmosphere from the water surface. Adsorption to solid soil phase is not expected.

Persistence and degradability

Assessment biodegradation and elimination (H2O):
Moderately/partially biodegradable. Easily eliminated from water.

Elimination information:
90 - 100 % BOD of the ThOD (14 d) (OECD Guideline 302 C) (activated sludge) Literature data.
39.5 % BOD of the ThOD (28 d) (OECD 301D; EEC 92/69, C.4-E) (activated sludge, domestic)
Assessment of stability in water:
According to structural properties, hydrolysis is not expected/probable.

Bioaccumulation potential
Assessment bioaccumulation potential:
Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

Bioaccumulation potential:
Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

Additional information
Other ecotoxicological advice:
Do not release untreated into natural waters.

13. Disposal Considerations
Incinerate in suitable incineration plant, observing local authority regulations.
A waste code in accordance with the European waste catalog (EWC) cannot be specified, due to dependence on the usage.
The waste code in accordance with the European waste catalog (EWC) must be specified in cooperation with disposal agency/manufacturer/authorities.
Contaminated packaging:
Contaminated packaging should be emptied as far as possible; then it can be passed on for recycling after being thoroughly cleaned.

14. Transport Information

<table>
<thead>
<tr>
<th>Domestic transport:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard class:</td>
<td>3</td>
</tr>
<tr>
<td>Packing group:</td>
<td>II</td>
</tr>
<tr>
<td>ID number:</td>
<td>UN 2056</td>
</tr>
<tr>
<td>Hazard label:</td>
<td>3</td>
</tr>
<tr>
<td>Proper shipping name:</td>
<td>TETRAHYDROFURAN</td>
</tr>
</tbody>
</table>

| Sea transport             |          |

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**IMDG**

| Hazard class: | 3 |
| Packing group: | II |
| ID number: | UN 2056 |
| Hazard label: | 3 |
| Marine pollutant: | NO |
| Proper shipping name: | TETRAHYDROFURAN |

**Air transport**

| Hazard class: | 3 |
| Packing group: | II |
| ID number: | UN 2056 |
| Hazard label: | 3 |
| Proper shipping name: | TETRAHYDROFURAN |

### 15. Regulatory Information

**Regulations of the European union (Labelling)**

EC-Number: 203-726-8

according to Annex I and Annex VI of the Regulation (EC) No 1272/2008:

<table>
<thead>
<tr>
<th>Hazard symbol(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Highly flammable.</td>
</tr>
<tr>
<td>Xn</td>
<td>Harmful.</td>
</tr>
<tr>
<td>R-phrase(s)</td>
<td></td>
</tr>
<tr>
<td>R11</td>
<td>Highly flammable.</td>
</tr>
<tr>
<td>R19</td>
<td>May form explosive peroxides.</td>
</tr>
<tr>
<td>R40</td>
<td>Limited evidence of a carcinogenic effect.</td>
</tr>
<tr>
<td>R36/37</td>
<td>Irritating to eyes and respiratory system.</td>
</tr>
<tr>
<td>R22</td>
<td>Harmful if swallowed.</td>
</tr>
<tr>
<td>R67</td>
<td>Vapours may cause drowsiness and dizziness.</td>
</tr>
<tr>
<td>S-phrase(s)</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Keep out of the reach of children.</td>
</tr>
</tbody>
</table>
| S16 | Keep away from sources of ignition - No
16. Other Information

Full text of hazard symbols and R-phrases if mentioned as hazardous components in section 2:

**F**  
Highly flammable.

**Xn**  
Harmful.

**11**  
Highly flammable.

**19**  
May form explosive peroxides.

**40**  
Limited evidence of a carcinogenic effect.

**36/37**  
Irritating to eyes and respiratory system.

**22**  
Harmful if swallowed.

**67**  
Vapours may cause drowsiness and dizziness.

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