Product Safety Summary

Phenol, 4-nonyl-, branched

This product safety summary is intended to provide a general overview of the chemical substance. The information on the Summary is basic information and is not intended to provide emergency response information or information on medical treatment. Additional information on this substance is available on its Material Safety Data Sheet which should be consulted prior to using the chemical.

1) Chemical Identity

Name: Phenol, 4-nonyl-, branched
Abbreviation: PNP
Common Names: Nonylphenol, para-nonylphenol
CAS Number: 84852-15-3
EINECS Number: 284-345-5

2) Product Overview

Para-Nonylphenol has the chemical formula C_{15}H_{24}O. It is a viscous white to pale yellow liquid at room temperature and is typically sold in liquid form in 180 kg drums. PNP may also be sold in in tank trucks or rail cars. In this form, the product must be heated to 150-200°F (65-93°C) to assure that its viscosity has been reduced prior to off-loading into storage facilities via pipeline. In molten form, PNP can cause thermal burns due to its elevated temperature.

PNP is a chemical intermediate which is exclusively marketed to other professional chemical companies for the primary purpose of acting as an intermediate raw material to be transformed into other chemical products. PNP has no major direct applications in its own right and is not intended as a direct component of any consumer product.

3) The Main End Uses For PNP Include:

- As a raw material for the manufacture of non-ionic surfactants and demulsifiers
- As a monomer for alkylphenol formaldehyde resins, epoxy resins and printing inks
- As a chemical intermediate for the synthesis of anti-oxidants
- As a chemical intermediate for the synthesis of metal chelating agents
4) Physical Properties

- Physical state / appearance at 77°F (25°C) white to pale yellow flakes
- Odour weak phenolic
- Density 0.9509 g/cm3 @ 77°F (25°C)
- Solubility in water (bulk) 5.7 mg/L @ 77°F (25°C)
- Vapor pressure 5 mm Hg @ 309°F (154°C)
- Melting point 14°F (-10°C)
- Boiling point 545°F (285°C) @ 1013 hPa
- Flash point (Tag closed cup) 300°F (156°C)
- Self ignition temperature 887°F (475°C)
- Log Kow 5.4 @ 73°F (23°C)

5) Health Information

PNP caused the following effects in animal studies.

PNP is:
- A low concern for acute toxicity by the oral or dermal route of exposure; signs of toxicity and mortality occur at very high dose levels that are much greater than typical human exposure
- Severeely irritating to skin and severely irritating to eyes
- Not a skin sensitizer
- Not mutagenic or clastogenic
- A low concern for carcinogenicity by genotoxic and non-genotoxic mechanisms
- A no observed adverse effect level (NOAEL) of 70 mg/kg body weight/day was concluded from a 2-generation reproduction toxicity study in Sprague-Dawley rats (OECD Guideline 416 and US EPA Guideline OPPTS 870.3800, Clubb and Jardine, 2006)

<table>
<thead>
<tr>
<th>Species</th>
<th>End Point</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit</td>
<td>Acute Dermal Exposure</td>
<td>LD50 = 3160 mg/kg</td>
</tr>
<tr>
<td>Rat</td>
<td>Acute Oral Toxicity</td>
<td>LD50 = 1300 mg/kg</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Eye Irritation</td>
<td>severe</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Skin Irritation</td>
<td>severe</td>
</tr>
</tbody>
</table>

6) Environmental Effects

Nonylphenol is very toxic to aquatic organisms. Special care should be taken to assure that PNP or mixtures containing PNP do not enter the aquatic environment.

<table>
<thead>
<tr>
<th>Species</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish (Fathead minnow), 96-hr</td>
<td>LC50 = 0.138 mg/L</td>
</tr>
<tr>
<td>Daphnia magna, 48-hr</td>
<td>EC50 = 0.035 mg/L</td>
</tr>
<tr>
<td>Algae (Scenedesmus subspicatus), 72-hr</td>
<td>EC50 = 0.056 mg/L (growth rate)</td>
</tr>
</tbody>
</table>
Environmental Fate

PNP is biodegradable. It is not bioaccumulative. It is photolytically degradable. In the atmospheric compartment its half-life is estimated at 3.16 hours.

7) Exposure Potential

Manufacturing

The manufacture of PNP is conducted in a continuous process via the catalysed reaction of phenol and propylene trimer. After recycle streams are taken into account, all reactants are essentially 100% utilized and converted to product. The chemical reactions are carried out in closed reactors under strictly controlled conditions aided by modern process control computers. Raw materials are added by dedicated pipelines so that there is no worker exposure or environmental release during the process. Chemical operators oversee the reaction conditions in the manufacturing plants. These individuals are highly trained in chemical processing and handling as well as in the correct use of safety equipment and engineering controls. It is customary for chemical operators who may handle nonylphenol use personal protection equipment that includes coveralls, long sleeve shirts, work shoes with protective coverings, eye and face protection, chemical resistant gloves and hardhats.

Finished products are isolated by distillation and are handled in a closed system of pipes and dedicated storage tanks. There is no opportunity for dermal or inhalation exposure during the product transfer process.

Reaction products are monitored for quality assurance (QA) using aliquots of the vessel contents collected from controlled sampling spigots that precludes aerosol formation, splashing or spillage due to overflow. Samples analyzed in the QA lab are handled using good laboratory safety practices. No exposure to PNP is expected during the sampling or analytical processes.

Maintenance worker exposure to PNP during cleaning operations for storage vessels or shipping tanks is eliminated when proper engineering controls and required personal protective equipment are in use. Railcars and tank trucks are typically steam cleaned in an automated fashion. Workers complete the cleaning of these enclosures while wearing suitable personal protective equipment that includes chemical suits and respirators designed to protect against exposure.

Packaged Products

Protection from exposure to liquid, vapour or mist from manufacturing operations is accomplished via engineering controls in the production area. Dermal or inhalation exposure to liquid, vapour or mist from PNP by downstream users should be avoided.

Consult the relevant Material Safety Data Sheet for specific handling and packaging disposal precautions.
Consumer Products

PNP has no direct application in consumer products and is sold only to professional chemical companies for use as a chemical intermediate which is transformed into other substances. Exposure to consumers has recently been evaluated by a European Risk Assessment report which can be found at


8) Risk Management Recommendations

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Ventilation should be sufficient to effectively remove, and prevent buildup of, any vapors or fumes that may be generated during handling or thermal processing. In order to ensure appropriate electrical safety practices are followed, consult applicable standards. These may include guidelines such as the National Fire Protection Association [NFPA] 70, "The National Electrical Code" and NFPA 499, "Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas ". NOTE: since this material's vapors or fumes can form explosive mixtures in air, ensure that any potential areas where explosions may occur are designed to minimize potential damage. For recommendations to prevent such explosions and associated damage, consult applicable guidelines such as NFPA 69, "Standard on Explosion Prevention Systems" and/or NFPA 68, "Guide for Venting Deflagrations". Keep working clothes separately and do not take them home

9) State Agency Review

Nonylphenol has been registered under REACH Regulation (EC) 1907/2006 and reviewed on OECD HPV. An OECD HPV SIDS Initial Assessment Report, and EU Risk Assessment Report, United Kingdom 2002, are available.
10) Regulatory Information, Classification and Labelling

GHS classification of PNP according CLP (CE) 1272/2008:

<table>
<thead>
<tr>
<th>Acute Toxicity</th>
<th>Category</th>
<th>H302 Harmful if swallowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin/Eye corrosion</td>
<td>Category 1B</td>
<td>H314 Causes severe skin burns and eye damage</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Category 2</td>
<td>H361 Suspected of damaging fertility or the unborn child</td>
</tr>
<tr>
<td>Acute aquatic toxicity</td>
<td>Category 1</td>
<td>H400 Very toxic to aquatic life</td>
</tr>
<tr>
<td>Chronic aquatic toxicity</td>
<td>Category 1</td>
<td>H410 Very toxic to aquatic life with long lasting effects.</td>
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Signal Word: Danger

11) Conclusion

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12) Contact Information within Company

For further information please contact:  sds.info@siigroup.com