

# China Petrochemical Development Corporation

## Safety Data Sheet

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### 1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

Product Name: Caprolactam
Other Name: CPL
Relevant Identified Uses: Manufacturing of synthetic fibers (Nylon 6), plastics, bristles, film; paint (coating material), synthetic leather; plasticizer; paint solvents; poly urea fortifier; amino acids, diaminocaproic acid synthesis.
Details of the Supplier: Name: China Petrochemical Development Corporation (CPDC) Tou-Fen Plant Address: No. 217, Sec.2, Tzyh-Chyang Rd., Tou-Fen City, Miaoli County, Taiwan (R.O.C.) Phone Number: 886-37-623381
Name: China Petrochemical Development Corporation (CPDC) Hsiaokang Plant Address: No. 34, Chunglin Rd., Hsiaokang Dist., Kaohsiung City, Taiwan (R.O.C.) Phone Number: 886-7-8711161
Emergency Phone Number: Tou-Fen Plant Phone Number: 886-37-623381      Fax Number: 886-37-637040 Hsiaokang Plant Phone Number: 886-7-8711161      Fax Number: 886-7-8712044

### 2. HAZARDS IDENTIFICATION

Hazard Classification: Acute toxicity, Inhalation (Category 4) Acute toxicity, Oral (Category 4) Eye irritation (Category 2A) Skin irritation (Category 2) Specific target organ toxicity - single exposure (Category 1) Specific target organ toxicity - repeated exposure (Category 1)
Label elements: Pictogram: Exclamation mark, Health hazard Signal word: Warning Hazard Statement(s): Harmful if swallowed. Harmful if inhaled. Causes skin irritation. Causes serious eye irritation. Causes damage to organs through prolonged or repeated exposure. Causes damage to organs. Precautionary Statement(s): Store in a well-ventilated place. Do not breathe dust. Remove/Take off immediately all contaminated clothing. Wear face shield/eye protection. Use only outdoors or in a well-ventilated area. Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Other hazards: —



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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name: Caprolactam
Synonyms: Caprolactam monomer · Widlon · 2-Perhy-droa-zepinone · Alkamid · 6-Aminocaproic acid lactam · 6-Aminohexanoic acid cyclic lactam · 1-Aza-2-cyclohepta-none · Bonamid · Capron · Chemlon · Danamid · Hexahydro-2-azrpinone · 6-Hexanela-ctam · Hexanone isoxime · Kapromine · 2-Ketohexamethyleneimine · 2-Oxohexamethyleneimine
CAS No.: 105-60-2
Hazardous Components (Percentage Composition) : more than 99%

### 4. FIRST AID MEASURES

First Aid Measures of Different Exposure Routes: If inhaled: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician. In case of skin contact: Wash off with soap and plenty of water. Remove polluted clothing and shoes which shall be cleaned before next usage. If continuously feeling irritation, consult a physician. In case of eye contact: Do not rob or close the eyes. Rinse opened eyes thoroughly with plenty of water for at least 15 minutes or until the pollutant entirely removed and consult a physician. If swallowed: Never give anything by mouth to an unconscious person. Rinse mouth with 240 – 300 ml water. Do not emetic. Consult a physician.
Most Important symptoms and Effects, Both Acute and Delayed: —
Essential Protection for First Aiders: conduct first aids in the safety zone with level C protection equipment.
Indication of any immediate medical attention and special treatment needed: If swallowed, gastric lavage or activated carbon may be applied.

### 5. FIREFIGHTING MEASURES

Suitable Extinguishing Media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special hazards arising from the burned substance: Irritant toxic gas may emitted in the fire
Special Firefighting Precautions: <ol style="list-style-type: none"><li>1. Prevent the leaked substance entry into sewers or ditches. The trench can by applied for appropriate treatment.</li><li>2. Do not move the heated containers in the fire.</li><li>3. The substance is strong oxidant and may ignite combustible material. The combustible material shall be removed or segregated in the fire.</li></ol>
Advised Equipment for Firefighters Wear self contained breathing apparatus (SCBA) and fully covered fire preventive clothing.

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### 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: <ol style="list-style-type: none"> <li>1. Evacuate personnel to safe areas before polluted area entirely cleaned up.</li> <li>2. The cleaning works shall be carried out by trained personnel.</li> <li>3. Use personal protective equipment.</li> <li>4. Avoid dust formation. Avoid breathing vapors, mist or gas. Avoid breathing dust.</li> </ol>
Environmental precautions <ol style="list-style-type: none"> <li>1. Ensure adequate ventilation.</li> <li>2. Extinguish or remove all ignition sources.</li> <li>3. Contact safety and environmental government authorities.</li> </ol>
Methods and Materials for Containment and Cleaning up: <ol style="list-style-type: none"> <li>1. Do not touch leaked substance.</li> <li>2. Do not let product enter drains or confined space.</li> <li>3. Encircled leaked substance with non-reactive mud or other similar stable and incombustible material.</li> <li>4. Small Amount Leakage: Pick up and arrange disposal without creating dust. Vacuum up and shovel. Keep in suitable, closed and clear labeled containers for disposal. Wash the contaminated area with water.</li> <li>5. Large Amount Leakage: Contact firefighting unit, emergency response unit and supplier for assistance.</li> </ol>

### 7. HANDLING AND STORAGE

Handling: <ol style="list-style-type: none"> <li>1. Use non-sparking tools to open containers. Avoid dust generating.</li> <li>2. Do not conduct cutting, gridding and welding near the containers of the substance.</li> <li>3. Containers shall be sealed when not in use.</li> <li>4. Prevent containers being damaged.</li> <li>5. Entirely washed after used.</li> <li>6. Avoid contact with skin and eyes or residue on the clothing.</li> <li>7. Hazardous residue may be remained in the used empty containers.</li> <li>8. Avoid static electricity generating. All equipment shall be grounded to the equipotential.</li> <li>9. Ensure the process enclosed to avoid releasing of dust and aerosols.</li> <li>10. Provide appropriate exhaust ventilation at places where dust is formed.</li> </ol>
Storage: Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Keep away from incompatible materials and ignition sources.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Control: Overall or local ventilation (Local exhausting ventilation is better).			
Control Parameters			
Permissible Exposure Level TWA of 8 hour	Permissible Exposure Level STEL	Permissible Exposure Level Ceiling	Biological Exposure Indices BEIs
1 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	—	—
Personal Protective Equipment: <p style="margin-left: 20px;">Respiratory Protection: For emergency exposures or unusual operation (e.g. leakage clean up or confined space works ), use appropriate respirator or self contained breathing apparatus (SCBA)</p> <p style="margin-left: 20px;">Hand Protection: Handle with appropriate impervious gloves. Rubber or chloroprene rubber gloves are better. Gloves must be inspected prior to use.</p>			

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<p>Eye and Face Protection: Face shield and safety glasses can be applied. Do not wear contact lens during operation.</p> <p>Skin and Body Protection: Complete suit protecting with safety shoes, clothing and gloves made of appropriate material. Safety shower and eye wash equipment shall be installed at the workplace.</p>
<p>Hygiene Measures:</p> <ol style="list-style-type: none"> <li>1. Remove the contaminated clothing after work as soon as possible. The clothing shall be washed before reuse or discard. Laundry personnel shall be informed of hazards.</li> <li>2. Smoking and eating are prohibited at the workplace.</li> <li>3. Wash hands thoroughly after handling the substance.</li> <li>4. Keep workplace clean.</li> </ol>

### 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: colorless to white molten crystalline	Odor : Unpleasant smell
Odor Threshold: 6.16ppm	Melting point: 69.2°C
pH Value: 7.0 - 8.5 at 333 g/l	Boiling Point or Boiling Range : 268.3 °C
Flammability (solid, gas):—	Flash Point: 130 °C (Closed-cup method)
Decomposition Temperature: —	Explosion Range: 1.4% - 8%
Auto-ignition Temperature: 375°C	Vapor Density: 3.9 (Air = 1)
Vapor Pressure: 0.1 mmHg (20°C)	Solubility: 4,560 g/L (Water, 20°C)
Relative Density: 1.05 (Water=1)	Volatilization rate: —
Octanol-Water Partition Coefficient (logKow): -0.19	Viscosity: —

### 10. STABILITY AND REACTIVITY

Reactivity: This substance is stable under normal circumstances
<p>Possibility of Hazardous Reactions:</p> <ol style="list-style-type: none"> <li>1. Acetic acid, dinitrogen trioxide: Explosive reaction.</li> <li>2. Strong mineral acid: Hydrolysis.</li> </ol>
Conditions to Avoid: Hygroscopic
<p>Incompatible Materials:</p> <ol style="list-style-type: none"> <li>1. Acetic acid, dinitrogen trioxide</li> <li>2. Strong mineral acid</li> </ol>
Hazardous Decomposition Products: Carbon oxides, hydroxides.

### 11. TOXICOLOGICAL INFORMATION

Exposure Routes: Skin contact, inhalation, ingestion or eye contact.
<p>Symptoms:</p> <p>Irritation, cough, low blood pressure, fever, leukocytosis, nausea, abdominal pain, pulmonary edema, burns and conjunctivitis.</p>
<p>Acute Toxicity:</p> <p>Inhaled:</p> <ol style="list-style-type: none"> <li>1. Respiratory irritation, cough, low blood pressure, fever, leukocytosis, nausea, abdominal pain and delayed pulmonary edema.</li> <li>2. May cause respiratory allergies.</li> </ol> <p>Skin contacted: Irritation; long term exposure or contacting with the molten substance may cause burns.</p> <p>Eye Contacted: Irritation or conjunctivitis</p> <p>Ingested: Irritation and burns.</p>

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### Toxicology Experimental Data (Experimental animals, Exposure Route):

LD<sub>50</sub>: 1,210 mg/kg (Rat, Oral)  
LC<sub>50</sub>: 8.16 mg/l/4Hr (Rat, Inhalative)  
Mild Irritation of Eyes: 500 mg/24H (Rabbit, Eyes)  
Moderate Irritation of Eyes: 20 mg/24H (Rabbit, Eyes)

### Chronic Toxicity:

1. Insomnia, loss of appetite, headache, chest discomfort, mild hypotension, fatigue, lymphoma fibromatosis, nasal bleeding, brittle nails, fingers sensitivity losing, flatulence and the mouth has a bitter taste.
2. Exposed over 18 years with the concentration more than 100 ppm may cause eye, nose and throat severe discomfort and burns.
3. Exposed to a concentration of 22 ppm or less may have chronic symptoms. With the exposure concentration rising, symptoms become more obvious.
4. Dermatitis and eczema.
5. Liver and kidney damage.
6. Under the exposure of 473 mg/24H (female rats of 60 days prior to mating, inhalation) menstrual cycles may change or become irregular.
7. ACGIH and IARC classified Caprolactam as Group 4: Probably not carcinogenic to humans.

## 12. ECOLOGICAL INFORMATION

### Ecological Toxicity:

LC<sub>50</sub> (Fish): 5,000 mg/l/96H  
EC<sub>50</sub> (Aquatic invertebrates): —  
Bio-concentration Factor (BCF): < 1

### Persistence and Degradability:

1. Caprolactam in the water will be decomposed by biodegradation and chemical decomposition. The phenomena of volatile, bioaccumulation, suspension and sediment adsorption are not significant.
2. Caprolactam in atmosphere is mainly decomposed into hydroxyl by photochemical reaction. Half-life in atmosphere is about 4.9 hours.  
Half-life in the surface of water: —  
Half-life in the ground water: —  
Half-life in the soil: —

Bio-accumulative Potential: —

### Mobility in soil:

Caprolactam in the soil will soon be decomposed by biodegradation and chemical decomposition.

Other Adverse Effects: —

## 13. DISPOSAL CONSIDERATIONS

### Waste Treatment Methods

1. Refer to the local relevant laws and regulations for disposal treatment.
2. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

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### 14. TRANSPORT INFORMATION

UN Number: —
UN Proper Shipping Name: —
Transport hazard class: —
Packaging Group: —
Marine Pollutant: —
Special precautions for users and transporters: The substance is transported by thermal insulation tankers in liquid state. The substance will become white crystalline flakes or molten in the case of cold or general temperature. The substance transported without insulation is in white crystalline flakes or chips and the properties is the same with liquid state.

### 15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006. Safety, Health and Environmental Regulations/Legislation Specific for the Substance: <ol style="list-style-type: none"><li>1. Occupational Safety and Health Act</li><li>2. Regulation of Occupational Safety and Health Facilities</li><li>3. Standards of Permissible Exposure Limits in Workplace</li><li>4. Methods and Facilities Standards for the Storage, Clearance and Disposal of Industrial Waste</li><li>5. Regulation of Labeling and Communication of Dangerous and Hazardous Chemicals</li><li>6. Public Hazardous Materials and Flammable Pressurized Gases Establishment Standards and Safety Control Regulations</li><li>7. Methods of Dangerous and Hazardous Chemical Evaluation and Classification</li></ol>
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### 16. OTHER INFORMATION

References	<ol style="list-style-type: none"><li>1. CHEMINFO Database, 2015</li><li>2. HSDB Database, 2015</li><li>3. ChemWatch Database, 2015</li><li>4. REACH registration information on ECHA CHEM website</li><li>5. Recommended Classification, Japan NITE</li><li>6. GHS Database, Taiwan MOL</li><li>7. Hazardous Chemical Database, Taiwan EPA</li></ol>
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Remark	The mark “—” are on behalf of no data available; The mark “/” are on behalf of not applicable to this substance.
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