



## 1. PRODUCT AND COMPANY INFORMATION

Product name: Cyclohexanone

Other name:

Recommended use / limitation:

Organic synthesis, especially referring to Adipic acid and Caprolactam (about 95%); polyvinyl chloride and its co polymers; isobutylenester polymer; timber coloring, paint remover, lacquer, stain removal, metal degreasing, brightener; homogenizing agent for dyeing silk and cleansing silk; additive of lubricating oil; solvents for cellulose, natural or synthetic resin, wax and fat.

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## 2. HAZARDS IDENTIFICATION

Classification : Flammable liquid Class 3, Substance of acute toxicology Class 4 (Swallowed), Substance of acute toxicology Class 3 (skin), Substance causing serious eye damage / irritation Class 2.

Designation content:

Symbolic symbols:



Warning : DANGER



Hazard warning messages:

Flammable liquid and vapor.  
Harmful if swallowed.  
Toxic in case of skin contact.  
Causes eye irritation.

Hazard preventive measures:

Place containers in a well-ventilated place  
Do not inhale gases/fumes/vapors/ mists  
Avoid eye contact.

Other hazards: -

## 3. COMPOSITION / INFORMATION ON INGREDIENTS

Pure substance

Chinese/English Name: 環己酮 Cyclohexanone

Synonym name: Anone, Cyclohexyl ketone, Hexanon, Ketohexamethylene, Nadone, Pimelic ketone, Pimelin keton, Sextone

CAS No : 108 94 1

Hazardous composition (percent): C 6 H 10 O 99%

## 4. FIRST AID MEASURES

First aid measures for different exposures:

### Inhalation:

1. Before performing first aid, be well protected to ensure your own safety.
2. Move away contaminating source or move the victim to fresh air.
3. If the victim stops breathing, immediately provide artificial respiration by trained people; if the heart stops beating, provide CPR.
4. Immediately obtain medical attention



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## **Skin contact:**

1. Where necessary, wear impervious gloves to avoid contact with this chemical.
2. Gently wash skin with lukewarm water for 20 minutes or continue washing until the contaminant is cleared.
3. During washing, remove contaminated clothing, shoes and leather accessories.
4. Immediately obtain medical attention.
5. Do not reuse contaminated clothing, shoes, and leather accessories before they are totally cleaned or discard them.

## **Eye contact:**

1. Where necessary, wear impervious gloves to avoid contact with this chemical.
2. Immediately hold the upper and lower eyelids open and gently flush the affected eye with slow moving lukewarm water for 20 minutes or continue flushing until the contaminant is flushed off.
3. Avoid clean water flowing in the unaffected eye.
4. If irritation persists after flushing, repeat flushing.
5. Immediately obtain medical attention.

## **Ingestion:**

1. If the victim is about to lose consciousness or has lost consciousness or is in a spasm do not feed the victim anything.
2. If the victim is conscious, give water to rinse his/her mouth.
3. Do not attempt to induce vomiting.
4. Give the victim 240 ~ 300 ml of water to drink
5. Immediately obtain medical attention.

Most critical symptom and hazard effect: High concentration vapors will cause inhibition of the nerve system.

Protection for first aid personnel: Wear Class C protective equipment and perform first aid in a safe area.

Notes to physicians: In case of swallowing, consider gastric lavage with perfusion of activated charcoal.



## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, alcohol resistant foam, carbon dioxide

Special hazards during fire fighting

1. Flammable liquid will form an explosive mixture with air at temperatures more than 44 C.
2. Vapor is heavier than air and can travel far away to an ignition source and flash back.
3. It will accumulate at lower ground level and increase risk of fire and toxicology.
4. Containers in fire may break when subjected to heat.

### Special fire fighting procedure:

1. Evacuate people and extinguish fire from a safe distance or in a protected location.
  2. Stay upwind to avoid hazardous vapors and toxic decomposition products.
  3. Before firefighting, first stop leaking. If it is impossible to stop leaking and no danger exists in surroundings, let the fire burn out. If fighting the fire without stopping leaking, vapor can form an explosive mixture with air and be ignited again.
  4. Isolate unburned materials and protect personnel.
  5. If safe to do so, move containers away from fire.
  6. Spray water to cool the storage tanks or containers exposed to fire.
  7. Spraying water may be ineffective but can dilute leaks and wash away from the ignition source.
  8. If spills are not ignited, spraying water will dissipate vapors and protect the people trying to stop the leaking.
  9. The water jet will be ineffective for fighting the fire.
  10. For a large fire in a large area, use an unmanned hose holder or an automatic swaying water nozzle.
  11. Evacuate the fire location as far as possible and allow the fire to burn out.
  12. Keep away from the storage tanks.
  13. If the safety valve of the storage tank sounds or discolors due to fire, evacuate immediately.
  14. Do not allow people not wearing special protective equipment to enter
- Special protective equipment for firefighters: Firefighters must wear respirator, protective gloves and fire-fighting clothing.



## 6. ACCIDENTAL RELEASE MEASURES

### Personal precautions:

1. Restrict people from entering the contaminated area before it is fully cleared and cleaned.
2. Make sure cleaning is handled by trained people.
3. Wear suitable personal protective equipment.

### Environmental precautions:

1. Use local exhaust and ventilation at the spilled area.
2. Extinguish or remove all ignition sources.
3. Notify government's safety, health and environment related units.

### Method for cleaning up:

1. Do not touch any runoff.
2. If safe to do so, try to stop or reduce leaks
3. If safety permits, move the leaking container to outdoors or an isolated area with good ventilation and transfer residues in a suitable container.
4. Avoid spills to sewers or a confined space.
5. For small leaks: take up leaks with inactive sorbents and keep them in a suitable container with a cover and clear label. Then wash the spilled area with water.
6. For large leaks: use sand, earth or other inactive substances to block spills. Transfer liquid to a suitable container using a pump or vacuum equipment. Use water to flush the spilled area.
7. Precautions: Contaminated sorbents and leaks are equally hazardous.



## 7. HANDLING AND STORAGE

### HANDLING:

1. This substance is a flammable and toxic liquid. Implement engineering controls when handling this substance and make good use of personal protective equipment. Working people should have suitable training in the dangers and safe usage of this substance.
2. Remove all ignition sources away from incompatible substance.
3. There must be No Smoking signs in the working area.
4. Empty tanks, containers and pipelines may still have hazardous residues, and therefore no welding, cutting, drilling or any hot work is permitted before they are cleaned up.
5. Emergency response equipment should be available to extinguish fire or handle leaks at any time.
6. Avoid generation of mist drops or vapor during operation. Operate and use the minimum quantity in the designated area with good ventilation. The storage area should be separated from the operational area.
7. Where necessary wear suitable personal protective equipment to avoid contact with chemicals or contaminated equipment.
8. Do not use with incompatible substances (e.g. strong antioxidant).
9. Use storage containers made of compatible materials only. When de bulking, be careful not to spill.
10. All operations of opening, pouring, and mixing should be done upwind.
11. Do not pour contaminated liquid back in the original storage container.
12. The container must be well labeled and closed tight when not in use and damage must be avoided



## **STORAGE:**

1. Store in a cool, dry and well ventilated place. Store away from direct sunlight, heat source s , ignition source s and incompatible substance s .
2. Storage equipment should be constructed with fire resistant materials.
3. The floor should be constructed with impervious materials to avoid absorption.
4. Build a slope or threshold or dig a ditch at the entrance of the storage area to lead leaks to a safe place.
5. The storage area should have clear designation, have no obstacles , and allow only authorized or trained people to come in.
6. The storage area should be separated from the working area, eating/drinking area and equipment protection area.
7. Fire extinguishers or leak cleanup equipment should be installed near the storage area.
8. Store in sturdy containers made of compatible materials. Unused or empty containers should keep closed tight to avoid damage. Do not stack containers.
9. Regularly check storage containers for any damage or leaking, and check that the storage contents have not expired.
10. Check that all newly arrived containers are properly labeled and are not damaged.
11. Keep collected leaks with containers made of compatible materials only.
12. Store at the recommended storage temperature by the chemical manufacturer or the supplier. Where necessary, a temperature detecting alarm should be installed to alert the temperature condition (too high or too low).
13. Use the ventilation system that has been grounded and will not generate sparks , and use approved explosion proof equipment and safe electrical system in the storage area.
14. Store in an approved fire resistant cabinet or storage room.
15. The storage tank should be placed on the ground and the whole bottom area should be sealed to prevent leakage. Around the storage tank there should build a dike to confine the whole storage volume.



## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### **ENGINEERING CONTROLS:**

1. The discharge vent runs directly outdoors.
2. Supply sufficient fresh air to supplement air being exhausted.

<u>Control parameters</u>			
TLA	TWA TLA	STEL TLA-C	BEIs
25 ppm (skin)	37.5 ppm (skin)	-	-

### **PERSONAL PROTECTIVE EQUIPMENT:**

#### **Respiratory protection:**

1. Less than 625 ppm: Continuous flow type air supplied respirator or power air purifying type respirator with an organic vapor cartridge.
2. Less than 700 ppm: Power air purifying type respirator with an organic vapor cartridge or full faced chemical cartridge type respirator with an organic vapor cartridge, gas mask with an organic vapor cartridge and full faced self-contained breathing apparatus or air supplied respirator. .
3. Unknown concentration: positive pressure type self-contained breathing apparatus, positive pressure full faced type air supplied respirator supplemented with positive pressure self-contained breathing apparatus.
4. Escaping: Gas mask with an organic vapor cartridge, escape type self-contained breathing apparatus.

#### **Hand protection:**

1. Impervious gloves made of materials of Isobutylene isoprene rubber, 4H and polyvinyl alcohol.

#### **Eye protection:**

1. Chemical safety goggles, full faced goggles.



## **Skin and body protection:**

1. Overall type protective clothing, working shoes, and safety shower equipment.

## **Hygiene practices:**

1. Remove contaminated clothing after work as soon as possible. Do not reuse it before it is washed clean or discard it. Inform the laundry washing people of contaminant hazard.
2. Smoking and eating or drinking is strictly prohibited in the working area.
3. Thoroughly wash hands after handling this substance
4. Always keep the working area clean.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance: Water white to light yellow, oily Odor: Acetone mint odor. liquid.

Odor threshold: 0.12-100 ppm (with detection) Melting point: -47 °C  
0.12 ppm (with smelling)

pH: nearly neutral

Boiling Point/ range: 157 °C

Flammability: (solid, gas): -

Flash point: 44 °C

Decomposing temperature: -

Test method: Closed cup

Autoignition temperature: 420 °C

Explosion limits: 1.1% 100 °C - 9.4%

Vapor pressure: 4 mmHg@20 °C

Vapor density: 3.38 (Air=1)

Density: 0.95 (H<sub>2</sub>O=1)

Solubility: Slightly soluble (2.3g/100g Water @20°C)

Octylalcohol / water partitioning coefficient

Evaporation rate: 0.29 (n Butyl Acetate=1)

log K<sub>ow</sub> : 0.81



## 10. STABILITY AND REACTIVITY

Stability: Stable at normal condition, may create peroxide.

### Hazardous reaction under special condition:

1. Strong oxidants (e.g. peroxide, nitric acid, per salt) increase risk of fire and explosion.
2. Nitric acid and hydrogen peroxide forms oily and explosive peroxide.
3. Corrosive to most plastics.

Conditions to be avoided: Heat, open flame, spark, and ignition source.

Substances to be avoided: Strong oxidant.

Hazardous decomposition products: ---

## 11. TOXICOLOGICAL INFORMATION

Route of entry: Inhalation, skin contact, eye contact, ingestion

Symptom:

Headache, nausea, faintness, drowsiness, nervous confusion, unconsciousness, death, skin and eye irritation.

Acute toxicology:

### Skin:

1. Its liquid will cause moderate to serious irritation, depending on concentrations.
2. It can be absorbed through the skin to cause inhibition of central nerve system like the symptom described in Inhalation

### Inhalation:

1. 75 ppm for 3~5 minute exposure will cause nose and throat irritation while 50 ppm will cause throat irritation and 25 ppm will cause no symptom.
2. High concentration will cause inhibition of the nerve system, such as headache, nausea, faintness, drowsiness and nervous confusion.
3. Very high concentration will cause unconsciousness and death.



## Ingestion:

1. Ingestion of large amount of cyclohexanone may cause inhibition of central nerve system like that described in Inhalation
2. When the substance enters the lungs, it will cause fatal lung swelling and bradypnea. It can also cause the heart to stop beating and death.

## Eye:

1. Solution of more than 15% concentration will cause serious and corrosive eye damage. It can cause permanent damage or blindness. Concentration of less than 10% may cause minor eye irritation.
2. The vapor will cause eye irritation.

LD50 (animal test, route of absorption): 1535 mg/kg (rat, swallowing)

948 mg/kg (rabbit, skin)

LC50 (animal test, route of absorption): 8000 ppm/4H (rat, inhalation)

500mg/(rabbit, skin): Causes minor irritation.

20 mg/ (rabbit, eyes): Causes serious irritation

## **Chronic toxicology or long term toxicology:**

1. Its liquid is a degreasing agent. Long term and repeated exposure may cause dermatitis. 11gm/Kg (pregnant guinea pig for 8-12 days, swallowed): Causes newly born rat poisoning. IARC lists it as Group 3: It is impossible to judge it as carcinogenic to the human body. ACGIH lists it as A4: It is impossible to judge it as carcinogenic to the human body.

## **12. ECOLOGICAL INFORMATION**

### **Ecological toxicology:**

LC50 (Fishes):

EC50 (Aquatic invertebrates): ---

Bioconcentration factor (BCF): ---



## **Persistency and degradability:**

1. According to test indication, cyclohexanone will rapidly biodegrade.
2. When cyclohexanone is released to water, it will slowly evaporate and biodegrade.

Half-life period (Air): 24 ~ 100 hours

Half-life period (Water surface): 74 ~ 100 hours

Half-life period (Groundwater):

Half-life period (Soil):

## **Bio-accumulation:** It is impossible to accumulate.

## **Fluidity in soil:**

When cyclohexanone is released to soil, it is expected to evaporate and biodegrade.

Other adverse effect :It is harmful to aquatic organisms.

## **13. DISPOSAL CONSIDERATIONS**

### **Disposing method:**

1. Dispose the substance according to relevant regulations.
2. Store the waste to be disposed according to inventory conditions.
3. Can use specific incineration or bury it in a hygiene landfill.

## **14. TRANSPORT INFORMATION**

UN Number : 1915

UNtransport name : Cyclohexanone

Transport hazard classification: Flammable liquid Class 3

Package classification: III

Oceanic pollutants (Yes/No): No

Special transport method and precautions: -



## 15. REGULATORY INFORMATION

### Applicable regulations:

1. Rules of Labor Safety and Health Facilities
2. Rules of Designation and Identification for Dangerous Goods and Harmful Substances.
3. Rules of Poisoning Prevention of Organic Solvent.
4. Standard for Allowable Concentrations of Harmful Substance in Air in Labor Working Environment
5. Road Safety Rules
6. Method and Facility Standards for Industrial Waste Storage, Clearance, and Disposal
7. Regulations Governing Safety and Setup Standard for Public Dangerous Goods and Flammable Compressed gases.

## 16. OTHER INFORMATION

Bibliography	<ol style="list-style-type: none"><li>1. CHEMINFO databank, CCINFO CD, 2005 2</li><li>2. HAZARDTEXT databank, TOMES PLUS CD, Vol.63, 2005</li><li>3. RTECS databank, TOMES PLUS CD, Vol.63, 2005</li><li>4. HSDB databank, TOMES PLUS CD, Vol. 63, 2005</li><li>5. ChemWatch Databank, 2004 4</li></ol>
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