China Petrochemical Development Corporation, Toufen Factory
Safety Data Sheet

Last update: Oct 14 2021

I. Product and Supplier Identification

Product identifier: Cyclohexanol

Also known as: ---

Intended use and limitations:

Used for soap making and as an additive in solvent and phenol-type pesticides; source of adipic acid for nylon making; cellulose alkyd and phenol resin solvent; additive; lacquer; paint and varnish; paint stripper; emulsification products, leather steeping; brightener; plasticizer; plastics; disinfectant

Manufacturer, importer or supplier's name, address and telephone number:

Name: China Petrochemical Development Corporation, Toufen Factory

Address: No.217, Sec. 2, Ziqiang Rd., Toufen City, Miaoli County 351, Taiwan (R.O.C.)

Telephone no.: 037-623381

Emergency telephone number and fax:

Telephone No.: 037-623381

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II. Hazard Identification

Classification of the Substance or Mixture:

Level 4 inflammable liquid; Level 4 acute toxic substance (ingestion); Level 2 skin corrosion / irritation; Level 2A serious eye corrosion / irritation; Level 3 toxic substance to specific target organ or system / single exposure

Pictogram:

Symbol: exclamation mark

Signal word: warning

Hazard statements:

Inflammable liquid

Harmful if ingested

Causes skin irritation

Causes severe eye irritation

May cause irritation to respiratory tracts

Precautionary statements:

Do not inhale gas / smoke / vapor / fume.

Avoid eye contacts

Use only at well ventilated locations.

Other hazards: ---

III. Composition / Information on Ingredients

Name: Cyclohexanol

Synonyms:

Cyclohexanol, Cyclohexyl alcohol, Hexahydrophenol, Hydroxycyclohexane, 1-Cyclohexanol, C6-H11-OH, C6-H12-O, adronal, amylcarbinol, anol, cyclic aliphatic alcohol, hexalin, hexylicalcohol, hydralin, hydrophenol, naxol, phenol, hexahydro-

CAS No: 108-93-0

Hazardous ingredient (%): 99-100

IV. First Aid Measures

First aid measures for different exposure paths:

Inhalation:	1. Remove the contamination source or more the patient to fresh air; 2. Seek medical assistance immediately.
Skin contact:	1. Rinse the affected area with mildly flowing warm water for 5 minutes or longer; 2. If the irritation persists, continue to rinse and seek medical assistance immediately.
Eye contact:	1. Prop the eyelids open and rinse the affected eye with mildly flowing warm water for 20 minutes or longer; 2. While rinsing, be careful not to let contaminated rinsing water into the uncontaminated eye; 3. Seek medical assistance immediately.
Ingestion:	1. Do not feed the patient anything through the mouth if he/she is about to lose consciousness, has lost consciousness or is having a spasm; 2. If the patient is conscious, rinse his/her mouth thoroughly with water; 3. Do not induce vomiting; 4 Give the patient 240 to 300ml of water to drink; 5. If the patient vomits spontaneously, have him/her rinse the mouth and drink water repeatedly; 6. Seek medical assistance immediately.

Most important symptoms and effects: ingestion in large quantity may lead to damage to kidneys, liver and blood vessels, loss of consciousness or even death.

Protection for first aid helper: Class C protection gear is required to administer first aid at a safe area.

Advice for physicians:

1. Give the patient oxygen for inhalation.
2. Consider gastric lavage for ingestion.

V. Firefighting Measures

Extinguishing agents: alcohol foam, CO_2, chemical powder, water mist

Special hazards arising from extinguishing fire:

1. The vapor is heavier than air and can spread a great distance; back flash is a possibility if ignition source is present.

Special fire extinguishing procedure:

1. Use water mist to reduce heat and cool the container off, and protect substances that are exposed to the fire.
2. Use water mist to drive vapor away and rinse the spill zone if the spills are not caught on fire.
3. Remove containers from the fire scene if it is safe to do so.

Special protection gears for firefighters: ---

VI. Accidental Release Measures

Personal precautions:

1. Keep people away from the spill zone until the spills are cleaned up.
2. Make sure that those who are cleaning have been properly trained.
3. Wear protection gears suitable for the clean-up.

Environmental precautions:

1. Provide ventilation at the spill zone.
2. Remove all possible ignition sources.
3. Inform the competent authorities of the government in charge of occupational safety and health and environmental protection.

Method and material for containment and clean-up:

1. Do not touch the spilled substances.
2. Keep the spills from flowing into storm drain, sewer system or any confined space.
3. Try to contain or reduce spills if it is safe to do so.
4. Contain the spills with sand, soil or an absorbent that does not react with the spilled substance.
5. For small amount of spills: absorb the spill with an absorbent that does not react with the spilled substance. Contaminated absorbent is as hazardous as the spills and, therefore, shall be placed in an appropriate container that is tightly lidded and properly labeled. Rinse the spill zone with water. Small amount of spill may be diluted with large quantity of water.
6. For large amount of spills: call the fire department, emergency response service and supplier for assistance.

VII. Handling and Storage

Handling:

1. The substance is a highly inflammable and toxic liquid. The engineering control and personal protection shall be in place to handle it. The workers shall be trained for the hazards of the substance and how to safely handle and use it.
2. Remove all possible ignition sources and keep heat and incompatible substances away.
3. There shall be a “No Smoking” sign at the work area.
4. Consider additional design to increase electric conductivity, since the liquid accumulates electric charges. If all vessels, transfer containers and pipelines are to be earthed, they shall be in contact with bare metal

when being earthed. The flow rate shall be reduced while transmitting the fluid to increase the operation time and, thus, increase the time that the liquid flows through the pipeline, or this should be done in low temperature.

5. When formulation is not performed in a closed system, make sure that the containers used for formulation and the conveying equipment and containers used for receiving the substance are connected at equal potential.
6. There may still be hazardous residues in empty vessels, containers and pipelines. Do not perform welding, cutting, drilling or any hot work before cleaning/purging.
7. A ventilation system that does not generate sparks shall be used at the work area, and equipment used shall be of an explosion-proofed type.
8. Always keep walkways and exits clear.
9. For areas of storage and handling the substance in large quantity, consider installing a leak and fire detection system and appropriate automatic fire extinguishing system or providing enough and available emergency handling equipment.
10. Avoid the generation of aerosols or vapor of the substance while handling. Operate at a well ventilated area in the minimum quantity possible. The handling and storage areas shall be separated.
11. Wear appropriate personal protection gears as appropriate to prevent any contact with this chemical substance or contaminated equipment.
12. Do not store this substance with any incompatible material (e.g. strong oxidants) to prevent possible danger of fire and explosion.
13. Use a container made of compatible material. Be careful not to spill when dispensing.
14. Used approved inflammable liquid storage containers and formulation equipment.
15. Do not return contaminated liquid back to its original storage container.
16. Containers shall be properly labeled. Keep the container tightly sealed and prevent damage when not in use.

Storage:

1. Store the substance at a cool, dry and well ventilated place and away from direct sunlight, heat, ignition source and incompatible materials.
2. The storage equipment shall be made of fire-resistant material.
3. The storage area shall be clearly labeled and obstacle-free; access to this area shall be authorized to only the assigned and properly trained personnel.
4. The storage area shall be separated from the work area and kept away from elevators, buildings, access to a room or main storage passage.
5. Appropriate fire extinguishers and leak handling equipment shall be provided nearby the storage area.
6. Check the storage containers for damage or leaks on a regular basis.
7. Check newly arrived containers for proper labeling and signs of damage.
8. Storage quantity shall be limited to a safe minimum.
9. Put the spilled substance in a contained made of compatible material.
10. The storage vessels shall be properly earthed and connected to other equipment at equal potential.
11. Do not store the substance indoors in large quantity. Keep the storage in an isolated and fireproofed building as much as practically possible.
12. The storage tank shall be of a type that stands on solid ground. The entire bottom shall be sealed to prevent leaks. A spill dike capable of containing the entire capacity of storage tank shall be installed around the tank.

VIII. Exposure Controls and Personal Protection

Engineering controls:

1. Local venting and overall ventilation devices shall be provided at the work area.
2. For use of the substance in large quantity, heating the substance or making aerosols, use local venting device or isolate the necessary procedure.

Control parameters			
Average allowable level, 8 hours/day TWA	Short-term average allowable level STEL	Max. allowable level CEILING	Biological index BEIs
50ppm	75ppm	---	1,2-cyclohexanol content in urine after a week of work (Nq, Ns); cyclohexanol content in urine at the end of day

Personal protection gears:

Breathing protection:

1. <400ppm: powered air purification breathing apparatus with organic filter canister or full-faced breathing mask with chemical filter canister, gas mask with organic vapor filter canister, full-faced portable or oxygen-supplying breathing apparatus
2. Unknown concentration: pressurized portable breathing apparatus, pressurized full-faced air-supplying breathing apparatus with pressurized portable breathing apparatus
3. Evacuation: gas mask with organic vapor filter canister, portable breathing apparatus for evacuation.

Hand protection: 1. Leak-proof gloves made of rubber-like materials such as polybutenol, butyl rubber, Teflon and Viton

Eye protection: 1. Chemical-safe anti-splash goggles or mask

Skin and body protection: 1. Overall made of any of the rubber materials above, work boots, safety shower

Health measures:

1. Remove contaminated clothing immediately after handling the substance, and clean it before next use or discard it properly. Inform the laundry worker of the hazard of contamination.
2. Smoking, eating and drinking are strictly prohibited at work place.
3. Wash hands thoroughly after handling the substance.
4. Keep the work place clean and tidy.

IX. Physical and Chemical Properties

Appearance (physical state, color etc.): Colorless viscous goo, liquid or moisture-absorbing solid (below 25℃) with the odor of camphor; absorbs moisture	Odor: camphor odor
Olfactory threshold: 0.058-0.155ppm (detection)	Melting point: 25.15℃
pH: neutral	Boiling point / range: 161℃
Flammability (solid, gas): ---	Flash point: 68℃
Disintegration temperature: ---	Test method (open / closed cup): closed cup
Self-ignition temperature: 300℃	Explosion limit: 2.4% (lower)
Vapor pressure: 1.125mmHg (25℃)	Vapor density: 3.46 (air = 1)
Density: 0.9493 (water = 1)	Solubility: 3.6/100ml @20℃ (water)
Octanol/water partition coefficient (log Kow): 1.23	Volatility: 0.05-0.08 (butyl acetate = 1)

X. Stability and Reactivity

Stability: stable under normal conditions

Possible hazardous reaction under special circumstances:

1. High humidity and temperature (>68℃)
2. Strong oxidants, such as H_2O_2, nitric acid and perchlorates: violate or explosive reaction; generates heat and pressure.

Conditions to avoid:

1. High humidity and temperature (>68℃)

Substances to avoid:

Strong oxidants, such as H_2O_2, nitric acid and perchlorates

Hazardous decomposition products: ---

XI. Toxicological Information

Paths of exposure: skin, inhalation, ingestion, eyes

Symptoms: irritation, vomiting, nausea, dizziness, skin dryness, anesthetic effects, slow reactions, stuttering

Acute toxicity:

Inhalation:

1. Exposure at **100ppm** causes irritation to nose and throat in **3-5** minutes; **2.** At greater concentration, the vapor will cause vomiting, headache, nausea, dizziness, fatigue and tremor; **3.** Inhalation of the aerosol (mist or fume) generated from normal handling of the substance may cause severe hazardous to human health; **4.** The substance may cause respiratory tract irritation or even more severe lung damage to some people; **5.** Inhalation of its vapor may lead to fatigue and dizziness

in addition to drowsiness, reduced alertness, loss of reflexes, poor body coordination and vertigo; **6.** The result of inhalation of high concentration of cyclohexanol 6 hours/day, 5 days/week for **5 to 11** weeks is intoxication, irritation of conjunctivas, tears, drooling, loss of coordination, anesthesia, mild tremor and death (**50%** rabbit, exposure to **1229ppm for 150h**; **997ppm for 300h**). It is proven that toxic deterioration in brain, heart, liver and kidneys are found in rabbits exposed to **997ppm** and **1229ppm,** and mild deterioration in liver and kidneys in rabbits exposed to **145ppm**.

Skin:

1. Mild irritation; **2.** Skin contact with the substance may cause immediate or delayed mild but obvious skin inflammation; repeated exposures will lead to contact dermatitis with rashes and blisters as symptoms; **3.** Skin contact with the substance may lead to damage to human health; as well as systematic influence due to skin absorption; **4.** Evidence has shown that skin exposure to **4%** of cyclohexanol in Vaseline results in redness and fluid accumulation; repeated or long-term contacts may lead to surface of skin falling off; high-concentration dosage will lead to tremor, intoxication, hypothermia or even death; **5.** Open wound, skin abrasion or sensitive skin shall not be exposed to the substance; **6.** The substance may cause hazardous systematic damage if finding its way into the blood system through skin cuts, abrasion or damage; **7.** Check the skin before using the substance and make sure skin wounds are properly covered.

Ingestion:

1. Similar to the effects cause by alcohols; **2.** Symptoms include coughing, vomiting, diarrhea, stomach ache, nausea and headache; **3.** Ingestion in large quantity may cause damage to kidneys, liver, blood vessels or even loss of consciousness and death; **4.** Accidental ingestion of the substance can be harmful; animal experiments have shown that ingestion of the substance in a quantity less than **150g** can cause death or severe damage to health; **5.** Ingestion of cyclohexanol can cause nausea and vomiting; large dosage may cause tremor-less damage to central nerve system; **6.** The symptoms that come with suppression of central nerve system include vertigo, headache, dizziness, nausea, anesthesia, slow reactions, stuttering, and even loss of consciousness; **7.** Severe intoxication may lead to respiratory failure or even death.

Eyes:

1. The fume causes eye irritation and splashing into the eyes cause severe irritation; **2.** Eye contact with cyclohexanol may lead to medium or severe but reversible irritation and cornea damage; **3.** The substance may cause eye irritation to some people and eye damage in **24** hours after the contact; **4.** Severe inflammation and pain; may cause cornea damage; **5.** Permanent damage to eye sight is possible if not treated properly; **6.** Repeated exposures are known to cause conjunctivitis.

LD_{50} (test animal, absorption path): **2060 mg/kg** (rat, ingestion)

LC_{50} (test animal, absorption path): ---

14600μg/24 hour(s) (rabbit, skin): mild irritation

Chronic or long-term toxicity:

1. The liquid dissolves the oil on the skin.
2. Long-term or frequent contact with skin may cause dermatitis.
3. Repeated or serious exposure may lead to enough absorption to reach intoxication through skin.
4. Long-term excessive inhalation of the vapor may cause irritation to eyes, nose and throat.
5. Long-term exposure to inhalation of the substance may cause respiratory tract diseases, difficulty in inhalation and other related systematic symptoms.
6. The substance may accumulate in human body and cause certain influences after repeated or long-term exposure at work place.
7. No specific disturbance is found in the autonomic nervous system after human body exposure to cyclohexanol at **100ppm** in two years.
8. **315mg/kg** (**21**-day pre-mating female rats, subcutaneous injection) may affect male reproduction system.

XII. Ecological Information

Eco-toxicity:

1. LC_{50} (fish): 720-1100mg/L/96 hour(s)
2. HC_{50} (aquatic invertebrates): ---
3. Bio-concentration Factor (BCF): 1.5-5.1

Persistence and degradability:

1. Cyclohexanol is easily bio-degradable.
2. It is expected to vaporize and bio-degraded when released to water.
3. It is expected to react with hydrogen radicals when released to atmosphere with a half-life of approximately 22 hours.

Half-life (air): ---
Half-life (surface water): ---
Half-life (groundwater): ---
Half-life (soil): ---

Bio-accumulative potential: unlikely, since the substance is degraded very quickly and expelled from human body.

Mobility in soil: it is expected to seep through the soil and bio-degraded when released to soil.

Other detrimental effects: ---

XIII. Disposal Considerations

Waste disposal method:

1. Empty containers may still pose chemical danger/hazard.
2. Give them back to the supplier for reuse or recycling as much as practically possible.
3. If a container cannot be cleaned efficiently to make it free of residue, or the container cannot be used to contain the same substance, it shall be punctured to prevent repeated uses and buried at a legal landfill.
4. Keep the original warning labels and SDS as intact as possible, and observe all precautions related to the product.
5. The regulatory requirements for waste disposal may differ from region to region. Users are advised to observe local regulations regarding waste disposal. In certain regions, specific wastes shall be tracked.
6. Users should consider reduced use, repeated use, recycling and disposal.
7. If the substance is not used or is contaminated, it shall be recycled to prevent misuse. It may be recycled by filtering, distilling or other means if contaminated. The expiration date shall be considered when disposing of such substances. The property of the substance may change over time during the process of use and render it impossible to be recycled or reused.
8. It is prohibited to discharge the water used in cleaning or for production into drainage system.
9. Collect as much treated water as possible before disposal.
10. All treated water shall comply with local laws and regulations before being discharged into sewer system. For any doubt, contact the competent authority.
11. Recycle as much as practically possible or consult with the manufacturer for recycling.
12. Consult with local or regional waste management authority for waste disposal.
13. Bury or incinerate at a qualified location.
14. Recycle or dispose empty containers at a qualified location as much as practically possible.

XIV. Transport Information

UN No.: ---

UN shipping name: ---

Hazard class: ---

Package category: ---

Marine contaminant (yes / no): no

Special shipping method and precautions: ---

XV. Regulatory Information

Applicable laws and regulations:

Occupational Safety and Health Act	Regulations for Labeling and Identification of Hazardous Chemicals
Regulations for the Prevention of Organic Solvent Intoxication	Standards of Permissible Exposure Limits of Airborne Hazardous Substances in Workplace
Management Rules for the Evaluation and Classification of Hazardous Chemicals	Methods and Facilities Standards for the Storage, Clearance and Disposal of Industrial Waste
Public Hazardous Substances & Flammable Pressurized Gases Establishment Standards & Safety Control Regulations	Rules for Occupational Health and Safety Facilities

XVI. Other Information

Reference	1. ChemInfo Database, 2016 2. ChemWatch Database, 2016 3. Reach registration data from Echa Chem website 4. Classification suggestions by National Institute of Technology and Evaluation, Japan	
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Prepared on	Oct 14 2021	
Note	In the SDS, "---" denotes no available information or data, and "/" denotes that the specific field does not apply to this substance.	