

Safety Data Sheet

I. Chemicals & Exhibitor Info

Product Information: LIQUID NITROGEN
Other Information: -
Suggested Use and Prohibitions: Used for oil refining, electronics and semi-conductor, plastic, cold food storage and packaging, chemical and metal heat treatment industries.
Manufacturer · Importer or Supplier Name, Addresses, Phone: China Man-made Fiber Corporation Kaohsiung Plant 8, Ching Chien Road, Dashe Township, Kaohsiung County, Taiwan, R.O.C Tel : (886)-7-3512161 ~ 9
Emergency Phone: (886)-7-3512161 ~ 9 Fax: (886)-7-3513035

II. Hazard Identification

Chemical Hazard Classification: Compressed Gas
Labeled Contents: Symbols:  Warning sign: Warning Hazard Warning Information: Contains refrigeration gases; may cause low temperature burns or damages. Hazard Prevention Measures: Place in dark, cool areas. Tightly-sealed container. Place container in a well-ventilated area.
Other Hazards: -

III. Composition / Information on Ingredients (Single)

English Name: Liquid Nitrogen
Synonyms: Azote Nitrogen
Chemical Abstracts Number (CAS NO.): 7727-37-9
Hazard Ingredient (%): 100

IV. First Aid Measures

Emergency and First Aid Procedures: Inhalation: 1. Make sure that self-protection measures are excellent to assure personal safety and perform rescue using “mutual support group”. 2. Remove pollution sources or move the patient to area with plenty of fresh air.
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3. If the patient has stopped breathing, let trained personnel apply artificial respiration; If there is no heartbeat, apply CPR immediately.
4. It is best to let trained personnel provide oxygen supply under the doctor's supervision.

Skin Contact:

1. If necessary, wear protective gloves to prevent contact with this chemical substance.
2. Remove pollution source and use gentle, warm water to wash the contaminated parts until the contaminants are removed.
3. Do not attempt to make the afflicted area hot, rub or dry heat the afflicted area.
4. Carefully peel the clothes from away from the afflicted parts and remove the remaining clothing.
5. Cover the afflicted area with gauze.
6. The patient is prohibited from smoking or drinking.

Eye Contact:

1. Remove the pollution sources.
2. Use gentle, warm water to wash the afflicted area until the contaminants are removed.
3. Do not attempt to make the afflicted area hot.
4. Cover both eyes with gauze.
5. The patient is prohibited from drinking or smoking.
6. Seek medical attention immediately.

Ingestion: -

Major Disease and Harm Effects:

Nitrogen is non-toxic and will replace oxygen in the body to induce lack of oxygen (suffocation). Liquid nitrogen will cause death and ulceration of the mucous membrane tissues.

First-Aid Personal Protection:

Must wear Class C protective equipment for performing first-aid in safe area.

Prompt to Doctor:

If inhaled, provide oxygen to the patient.

V. Fire Fighting Measure

Suitable Extinguishing Media:

Any fire extinguisher, dry chemical powder, carbon dioxide, water spray, water mist and foam applicable to the surroundings of the fire site.

Special Exposure Hazards:

1. Will not burn but steel cylinder or containers exposed in the fire site may crack.
2. Nitrogen will replace oxygen in the air resulting in asphyxiation.
3. Presence of refrigeration liquid in the fire site is especially dangerous because it will cause water to freeze quickly and may clog the pressure relief valve.

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4. High concentration of nitrogen may cause water vapor to collect or dense steam to form, thereby reducing the visibility.

Special Extinguishing Procedure:

1. If safety permits, move the containers away from the fire site.
2. Spray water to cool the containers exposed in the fire site.
3. Be careful not to block the pressure relief valve.
4. Stay away from the storage tank.
5. If possible, do not spray water on equipment that is not exposed in the fire site.
6. Spraying water may increase the volatility of liquid nitrogen.
7. Do not use water column on liquid nitrogen.
8. If liquid nitrogen is released into the air, decide whether to let the gas scatter to the air or stop the gas flow, whichever is safest.

Special Protection Equipment:

Fire fighters must wear full-body chemical protection outfits and air respirators (if necessary, add flash-proof aluminum covered coats).

VI. Accidental Release Measures

Personal Protection:

1. Restrict personnel from entering the polluted area until completely cleaned.
2. Make sure that only trained personnel are allowed to clean up.
3. Wear appropriate personal protection equipment.

Environmental Protection: Ventilate and change air in area.

Methods for Cleaning Up:

1. Do not touch the leaking substance.
2. Prevent the spilled substances from entering the drainage or closed spaces.
3. If safety permits, try to stop or reduce spillage. Under safe conditions, move the leaking container outdoors and turn the container around so that the gas leaks to the air.
4. Use soil, sand or similar stable, non-flammable substances that are not affected by extremely low temperature to surround the leakage.
5. For liquid nitrogen leakage, spraying water may increase its volatility otherwise the production of thick water mist will lower the visibility.
6. For large amount of leakage, contact the fire department, emergency rescue agency and supplier for assistance.

VII. Handling and Storage

Handling:

1. This substance is a refrigeration liquid that will cause great danger in closed areas and requires engineering control and protective facilities. Work personnel must be properly trained and notified of the danger and safe usage of this substance.

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2. Work area must be well ventilated to prevent lack of oxygen.
3. When using liquid nitrogen in closed areas, be careful in following all safety procedures.
4. Install continuous air detector to check for proper ventilation.
5. Do not use with incompatible substances (such as magnesium) as it will cause violent reactions.
6. Prevent ice from clogging the necks of the Dewar Flasks for liquid nitrogen.
7. Transport the refrigeration liquid containers carefully.
8. Use special pushcart or handcart for transport.
9. The steel cylinder should be placed vertically against the ground and fixed to the wall or pillar.
10. Steel cylinders must not be rolled, dragged, thrown or bumped against each other.
11. If it is necessary to use elevators to transport the refrigeration liquid, apply the proper measures to prevent possible injuries, such as transporting when no other passengers in the elevator.
12. When transferring refrigeration liquid to another container, the receiving container must be pre-cooled. Initial transfer must be slow. The refrigeration liquid vaporizes and the receiving container becomes cold.
13. Place objects into the refrigeration liquid slowly to reduce seething or splattering of the refrigeration liquid.
14. When stored under low temperature of liquid nitrogen, many frequently-used substances such as carbon steel, plastic and rubber become crisp and break easily or contract so that cracks appear on the joints.
15. All Dewar Flasks and pipes filled with liquid nitrogen must have proper pressure relief devices to prevent overly high pressure.
16. Make sure that the necessary emergency rescue equipment for fire and leakage are always ready at all times.
17. Look up relevant laws for liquid nitrogen.

Storage:

1. Check if all new steel cylinders are properly labeled and without damages.
2. Storage area should be labeled clearly, free of obstacles and only specified or trained personnel are allowed to enter.
3. Work area and storage area must be separated.
4. Post warning signs.
5. Check regularly for damages or leakage.
6. Store in dark, cool, dry, well-ventilated, fireproof areas far from flammable substances, corrosive gases, work area, dining area, ignition sources and exposure to direct sunlight.
7. Storage area should not be near elevators, hallways, loading and unloading areas.
8. Use storage containers and equipment designed especially for liquids.

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9. Stay far away from incompatible substances.
10. Prevent storage containers from contact with water to avoid formation of ice and clogging the pressure relief valve.
11. It is best to place Dewar Flasks for liquid nitrogen on the ground and fixed to the wall or pillar.
12. The cap of the Dewar Flasks for liquid nitrogen should be lightly loosened to prevent the entry of too much air or water vapor, but may still release pressure.
13. If the neck on the Dewar Flasks for liquid nitrogen is clogged by ice or ice formed in the air, remove according to the manufacturer's instructions.
14. This substance is heavier and colder than air, will accumulate in low-lying areas so it must be stored lower than the ground level.
15. Follow all laws and regulations for storage of refrigeration liquids.

VIII. Exposure Control / Personal Protection

Engineering Control:

1. Local gas discharge: General dilution and ventilation.
2. Provide sufficient fresh air supply to supplement the air discharged by the exhaust ventilation system.

Control Factor

TWA	STEL	CEILING	BEIS
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Personal Protection Equipment:

Respiratory Protection:

1. Under normal conditions, no respirator is required.
2. During emergency or unknown gas concentration or oxygen content is less than 18%, it is necessary to wear positive pressure full-faced self-contained breathing apparatus or positive pressure full-faced air-supplying respirator with positive pressure self-contained breathing apparatus.

Hand Protection: Thermal gloves that are resistant to low temperature.

Eye Protection: Anti chemical splashing safety goggles and mask.

Skin & Body Protection: Thermal apron or work boots that are resistant to low temperature

Hygiene Procedures:

1. After work, remove the contaminated clothes as quickly as possible. Throw away or wash clothes thoroughly before wearing again. Notify the laundry personnel of the danger of the contaminated clothes.
2. Smoking and eating are strictly prohibited in work areas.
3. Wash hands thoroughly after handling this substance.
4. Keep the work area clean.

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IX. Physical and Chemical Properties / Characteristics

Appearance: Colorless, extremely cold liquid.	Odor: Odorless
Odor threshold: Odorless	Melting point: -210 °C
pH value: -	Boiling Point / Boiling Range: -196 °C
Flammability (solid, gas): -	Flash Point: Non-combustible
Decomposition Temperature: -	Test Method: -
Spontaneous Temperature: -	Exposure Limits: -
Vapor Pressure: -	Vapor Density: 0.967 (air = 1)
Specific Gravity: 0.8088 (water = 1)	Solubility: Slightly water soluble
Log kow: -	Percent volatile: Fast

X. Stability and Reactivity

Stability: Stable under normal conditions.
Special Conditions of Hazardous Reaction: <ol style="list-style-type: none">1. Nitrogen gas is a stable substance and only reacts under extreme conditions (high temperature and pressure) or with highly active chemical substances.2. Lithium - nitrogen gas layer reacts with molten lithium.3. Titanium - burns in nitrogen gas.4. Calcium, strontium, barium - reacts and forms into nitrides at red-hot state.5. Carbon - forms cyanide when heated in the presence of base.6. Ozone - will induce explosive reaction.7. Oxygen - has the dangerous nature of liquid oxygen and produces violent reaction with organic substances.
Conditions to Avoid: High temperature, high pressure.
Incompatibility: Lithium, titanium, calcium, strontium, barium, carbon, ozone.
Hazardous Decomposition Products: -

XI. Toxicological Information

Exposure route: skin contact, inhalation, eye contact.
Symptoms: Lack of oxygen
Acute Toxicity: Skin contact: Prolonged exposure of skin to liquid nitrogen and its cold air will cause frostbite. Inhalation: <ol style="list-style-type: none">1. Air contains about 78% nitrogen gas and 21% oxygen. Under constant temperature and pressure, nitrogen is non-toxic. If the accumulated nitrogen content is over 78%, it will replace oxygen and induce lack of oxygen (suffocation) in body.2. The oxygen content in air must not be lower than 18%.3. Effect of lack of oxygen is:

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Oxygen concentration at 12 to 16% --- will accelerate the breathing and pulse rates, muscle coordination will be slightly affected. 10~14% --- irritable, exceptionally tired, harassed breathing. 6~10% --- nausea and vomiting, exhaustion or unconsciousness. Lower than 6% --- cramps, may lead to asphyxiation and death.

4. When compressed (such as decompression sickness), nitrogen gas can induce anesthetic effect and depressurization symptom (formation of nitrogen gas bubbles in the blood vessels).
5. Extremely cold vapor such as liquid nitrogen vapor can induce damages to the upper respiratory tract, edema, sores and blisters leading to the mildest death and ulceration of the mucous membrane tissues.

Eye contact:

Even for short contact, liquid nitrogen and its cold air will induce frostbite that leads to permanent injury or loss of eyesight.

LD50 (test animal, absorption route): -

LC50 (test animal, absorption route): -

Chronic: Prolonged inhalation of extreme cold air may injure the lungs.

XII. Ecological Information

Eco-toxicity:

LC50 (Fish): -

EC50 (aquatic invertebrates): -

Bio-concentration Factor (BCF): -

Durability and Degradability:

Half-life (air): -

Half-life (water surface): -

Half-life (underground water): -

Half-life (soil): -

Biological Accumulation: -

Fluidity in soil: -

Other adverse effects: -

XIII. Disposal Information

Disposal Information: Can disperse the gas into the air.

XIV. Transport Information

The United Nations Number (UN No.): 1977

UN Transport Name: Refrigeration Liquid Nitrogen

Transport Hazard Classification: Type 2.2 non-flammable, non-toxic gas.

Packaging Category: -

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Marine Pollutant (Yes/No): No
Special Transport Way and Note: -

XV. Regulation Information

Apply Regulation: <ol style="list-style-type: none">1. Regulations of Hazard Communication on Dangerous and Harmful Material.2. High pressure gas labor safety regulation.3. Traffic Safety Regulations.4. Standards for the Storage, Clearance, and Disposal of Industrial Waste.
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XVI. Other Information

Reference	1. Council of Labor Affairs, Executive Yuan, Taiwan, GHS in Taiwan website. http://ghs.cla.gov.tw/tw/ghs_main.asp	
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