MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TAIYU INDUSTRIAL GASES Limited
16/F, Kowloon building, 555 Nathan Road, Mongkok Kowloon,
Hong Kong
TELEPHONE NUMBER: (852)22979277

Chengdu Taiyu Industrial Gases Co.,Ltd
Chengluo Avenue, Longquan District,
Chengdu City, China (Mainland)
TELEPHONE NUMBER: (86) 28-88455212(commonly)

SUBSTANCE: HYDROGEN CHLORIDE, ANHYDROUS
TRADE NAMES/SYNONYMS:
HYDROCHLORIC ACID, ANHYDROUS; HYDROGEN CHLORIDE; SPIRITS OF SALT; MURIATIC ACID; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; ANHYDROUS HYDROCHLORIC ACID; HYDROGEN CHLORIDE (HCl); UN 1050; CIH; MGI11150; RTECS MW4025000
CHEMICAL FAMILY: acids, inorganic
CREATION DATE: May 04 1990
REVISION DATE: Mar 18 2004

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2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: HYDROGEN CHLORIDE, ANHYDROUS
CAS NUMBER: 7647-01-0
EC NUMBER (EINECS): 231-595-7
EC INDEX NUMBER: 017-002-00-2
PERCENTAGE: 100

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3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=1
EMERGENCY OVERVIEW:
PHYSICAL DESCRIPTION: Colorless gas or fuming liquid with a suffocating odor.
MAJOR HEALTH HAZARDS: respiratory tract burns, skin burns, eye burns, mucous membrane burns
PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. May react on contact with water.
POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: burns

LONG TERM EXPOSURE: burns
SKIN CONTACT:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns
EYE CONTACT:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns

INGESTION:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns
CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

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4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.
SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.
EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. Give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.
NOTE TO PHYSICIAN: For inhalation, consider oxygen. Avoid gastric lavage or emesis.

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5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Containers may rupture or explode if exposed to heat.
EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical
Large fires: Use regular foam or flood with fine water spray.
FIRE FIGHTING: Do not get water inside container. Move container from fire area if it can be done without risk. Cool containers with water spray until

well after the fire is out. Stay away from the ends of tanks. Keep unnecessary people away, isolate hazard area and deny entry.

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6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE:

Reduce vapors with water spray. Stay upwind and keep out of low areas. Collect runoff for disposal as potential hazardous waste.

SOIL RELEASE:

Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material. Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash).

WATER RELEASE:

Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash).

OCCUPATIONAL RELEASE:

Stop leak if possible without personal risk. Reduce vapors with water spray. Do not get water directly on material. Do not get water inside container. Keep unnecessary people away, isolate hazard area and deny entry. Small spills: Flood with water. Large spills: Dike for later disposal. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Evacuation radius: 150 feet. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

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7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Protect from physical damage. Store in a cool, dry place. Store in a well-ventilated area. Keep separated from incompatible substances. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

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8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

HYDROGEN CHLORIDE, ANHYDROUS:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):

5 ppm (7 mg/m3) OSHA ceiling

2 ppm ACGIH ceiling

5 ppm (7 mg/m3) NIOSH recommended ceiling

7.6 mg/m3 (5 ml/m3) DFG MAK (peak limitation category - I, with excursion factor of 1)

10 ppm (15 mg/m3) EC OEL STEL

5 ppm (8 mg/m3) EC OEL TWA

5 ppm (8 mg/m3) UK OES STEL (gas) (mist)

1 ppm (2 mg/m3) UK OES TWA (gas) (mist)

MEASUREMENT METHOD: Silica gel tube; Sodium bicarbonate/Sodium carbonate; Ion chromatography; NIOSH IV # 7903, Inorganic Acids

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

50 ppm

Any chemical cartridge respirator with cartridge(s) providing protection against this substance.

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

Any powered, air-purifying respirator with cartridge(s) providing protection against this substance.

Any supplied-air respirator.

Any self-contained breathing apparatus with a full facepiece.

Escape -

Any air-purifying respirator with a full facepiece and an acid gas canister.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

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9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION: Colorless gas or fuming liquid with a suffocating odor.

MOLECULAR WEIGHT: 36.46

MOLECULAR FORMULA: H-Cl
BOILING POINT: -121 F (-85 C)
FREEZING POINT: -175 F (-115 C)
VAPOR PRESSURE: 3040 mmHg @ 17.8 C
VAPOR DENSITY (air=1): 1.268
SPECIFIC GRAVITY (water=1): 1.187 @ -85 C
WATER SOLUBILITY: 82.3% @ 0 C
PH: acidic
VOLATILITY: Not applicable
ODOR THRESHOLD: 1-5 ppm
EVAPORATION RATE: Not applicable
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
  Soluble: alcohol, ether, benzene, methanol

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10. STABILITY AND REACTIVITY

REACTIVITY: May react with evolution of heat on contact with water.
CONDITIONS TO AVOID: Minimize contact with material. Avoid inhalation of material or combustion by-products. Containers may rupture or explode if exposed to heat.
INCOMPATIBILITIES: cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, metal salts
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
  ACETIC ANHYDRIDE: Violent reaction.
  ALCOHOLIC HYDROGEN CYANIDE: Explosive reaction.
  ALUMINUM: Explosion.
  ALUMINUM-TITANIUM ALLOYS: Ignites or incandesces when heated.
  2-AMINOETHANOL: Violent reaction.
  AMMONIUM HYDROXIDE: Violent reaction.
  BASES: Violent reaction.
  BRASS: Corrodes.
  BRONZE: Corrodes.
  CALCIUM CARBIDE: Reacts with incandescence.
  CALCIUM HYPOCHLORITE: Ignition.
  CESIUM ACETYLIDE: Ignites on contact.
  CHLORINE + DINITROANILINES: Vigorous reaction with release of flammable hydrogen gas fumes.
  CHLOROSULFONIC ACID: Violent reaction.
  1,1-DIFLUOROETHYLENE: Extremely exothermic decomposition reaction.
  DOWICIL 100: Decomposes.
  ETHYLENE DIAMINE: Violent reaction.
  ETHYLENE IMINE: Violent reaction.

FLUORINE: Ignites on contact.
HEXALITHIUM DISILICIDE: Incandescesent.
IRON: Corrodes with evolution of flammable hydrogen gas.
MAGNESIUM BORIDE: Produces a spontaneously flammable gas.
MERCURIC SULFATE: Violent reaction at 125 C.
METAL ACETYLIDES: Violent reaction.
METALS: Severe corrosion with evolution of flammable hydrogen gas.
OLEUM: Violent reaction.
OXIDIZERS (STRONG): Violent reaction.
OXYGEN + PLATINUM: Ignites on contact.
PERCHLORIC ACID: Violent reaction.
PLASTICS, RUBBER, COATINGS: Attacks.
POTASSIUM PERMANGANATE: Explosion hazard.
BETA-PROPIOLACTONE: Violent reaction.
PROPYLENE OXIDE: Violent reaction.
RUBIDIUM ACETYLIDE: Ignites on contact.
SILICA (GEL): Incompatible.
SODIUM: Vigorous or explosive reaction.
SULFURIC ACID: Explosive reaction with release of toxic hydrogen chloride gas.
TETRASELENIUM TETRANITRIDE: Explodes on contact.
VINYL ACETATE: Violent reaction.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: chlorine
POLYMERIZATION: Will not polymerize.

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11. TOXICOLOGICAL INFORMATION

HYDROGEN CHLORIDE, ANHYDROUS:
IRRITATION DATA:
5 mg/30 second(s) rinsed eyes-rabbit mild; 4 percent/24 hour(s) skin-human mild
TOXICITY DATA:
2857 ug/kg oral-man LDLo; 420 ul/kg oral-woman LDLo; 1300 ppm/30 minute(s) inhalation-human LCLo; 3000 ppm/5 minute(s) inhalation-human LCLo; 81 mg/kg unreported-man LDLo; 3124 ppm/1 hour(s) inhalation-rat LC50; 1108 ppm/1 hour(s) inhalation-mouse LC50; 40142 ug/kg intraperitoneal-mouse LD50; 900 mg/kg oral-rabbit LD50; 4413 ppm/30 minute(s) inhalation-rabbit LCLo; 4413 ppm/30 minute(s) inhalation-guinea pig LCLo; 0.1 gm/m3 inhalation-mammal LC50; 5066 mg/m3/90 minute(s) inhalation-rabbit LCLo; 5066 mg/m3/90 minute(s) inhalation-guinea pig LCLo; 6400 mg/m3/30 minute(s) inhalation-rabbit LCLo; 6400 mg/m3/30 minute(s) inhalation-guinea pig LCLo; 60938 mg/m3/5 minute(s) inhalation-rat LC50; 20487 mg/m3/5 minute(s)

inhalation-mouse LC50; 7004 mg/m3/30 minute(s) inhalation-rat LC50; 3940 mg/m3/30 minute(s) inhalation-mouse LC50; 450 mg/m3/6 hour(s) inhalation-mammal TCLo; 7.3 mg/kg intratracheal-dog LDLo; 75 mg/m3 inhalation-human LCLo; 50 mg/m3 inhalation-human TCLo; 685 ug/m3/24 hour(s)-84 day(s) continuous inhalation-rat TCLo; 149 mg/m3/6 hour(s)-5 day(s) intermittent inhalation-rabbit TCLo; 150 mg/m3/6 hour(s)-50 day(s) intermittent inhalation-rabbit TCLo; 150 mg/m3/6 hour(s)-50 day(s) intermittent inhalation-cat TCLo

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:

Corrosive: inhalation, skin, eye, ingestion

ACUTE TOXICITY LEVEL:

Toxic: inhalation

Moderately Toxic: ingestion

MUTAGENIC DATA:

DNA repair - Escherichia coli 25 ug/well; sex chromosone loss and non disjunction - Drosophila melanogaster inhalation 100 ppm 24 hour(s); sex chromosone loss and non disjunction - Drosophila melanogaster oral 100 ppm; cytogenetic analysis - grasshopper parenteral 20 mg; cytogenetic analysis - hamster lung 30 mmol/L; cytogenetic analysis - hamster ovary 8 mmol/L

REPRODUCTIVE EFFECTS DATA:

450 mg/m3 inhalation-rat TCLo/1 hour(s) 1 day(s) pre pregnancy continuous

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Inhalation of gas or fumes at levels of 5-35 ppm may cause irritation and burning of the throat, with coughing and choking. Concentrations of 50-100 ppm may be barely tolerable

for 1 hour. High levels may cause inflammation, and occasionally ulceration of the nose, throat or larynx, bronchitis, pneumonia, palpitations, and headache. Higher concentrations may cause necrosis of the tracheal and bronchial epithelium, nasoseptal perforation, atelectasis, emphysema, damage to pulmonary blood vessels, and lesions of the liver and other organs. Death may be due to laryngeal spasm, bronchopneumonia or pulmonary edema. Concentrations of 1300-2000 ppm may be dangerous, even on brief exposures. An environmental exposure to hydrochloric acid has resulted in chronic neurobehavioral dysfunction. Reproductive effects have been reported in animals.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged exposure may cause erosion and discoloration of exposed teeth, chronic bronchitis, and gastritis.

SKIN CONTACT:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, inflammation, ulceration, necrosis, and chemical burns. Shock symptoms may develop including rapid pulse, sweating and collapse. Photosensitization reactions may occur in persons previously exposed. Contact with compressed gas may cause frostbite.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged contact with vapors or dilute solutions may cause dermatitis. Photosensitization may occur.

EYE CONTACT:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, conjunctivitis, corneal necrosis, and burns with impairment or permanent loss of vision. A drop of hydrochloric acid splashed in the eye and immediately washed out has produced a white coagulation of the corneal and conjunctival epithelium. Animals exposed to vapor concentrations of 1350 ppm for one and a half hours showed clouding of the cornea. Those exposed to 300 ppm for 6 hours showed slight erosion of the corneal epithelium. Contact with compressed gas may cause frostbite.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Animals exposed to vapor at 100 ppm for 6 hours daily, for 50 days, showed only slight unrest and irritation of the eyes, but no ocular injury. Effects are dependent upon concentration and duration of exposure. Conjunctivitis or effects similar to those for acute exposure may occur.

INGESTION:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): May cause burns of the mouth, throat, esophagus, and stomach with consequent pain, uneasiness, nausea, salivation, vomiting, diarrhea, chills, shock, and intense thirst. Nephritis, fever, perforation of the intestinal tract, and circulatory collapse may occur. Death may be due to esophageal or gastric necrosis.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): No data available.

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12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: 21900 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (Pimephales promelas)

INVERTEBRATE TOXICITY: 560 ug/L 48 hour(s) EC50 (Immobilization) Water flea

(Daphnia magna)
ALGAL TOXICITY: 800 ug/L 1600 week(s) EC50 (Population Size Reduction) Green algae (Chlorella pyrenoidosa)
PHYTOTOXICITY: 1000 ug/L 4-48 week(s) (Residue) Water-hyacinth (Eichhornia crassipes)
FATE AND TRANSPORT:
BIOCONCENTRATION: 1000 M 24 week(s) BCF (Residue) Blue-green algae (Coccochloris sp) 1E-6.5 M

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D002. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
ID NUMBER: UN1050
HAZARD CLASS OR DIVISION: 2.3
LABELING REQUIREMENTS: 2.3; 8
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden
CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Hydrogen chloride, anhydrous
UN NUMBER: UN1050
CLASS: 2.3; 8
LAND TRANSPORT ADR:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
UN NUMBER: UN1050
CLASS: 2
CLASSIFICATION CODE: 2TC
LABELS: 2.3(+8)

LAND TRANSPORT RID:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
UN NUMBER: UN1050
CLASS: 2
CLASSIFICATION CODE: 2TC
LABELS: 2.3; 8; (+13)
AIR TRANSPORT IATA:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
UN/ID NUMBER: UN1050

CLASS OR DIVISION: 2.3
SUBSIDIARY RISK: 8
AIR TRANSPORT ICAO:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
UN NUMBER: UN1050
CLASS OR DIVISION: 2.3
SUBSIDIARY RISK: 8
MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Hydrogen chloride, anhydrous
UN NUMBER: UN1050
CLASS OR DIVISION: 2.3
SUBSIDIARY RISK(S): 8

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (liquid)
SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 500 LBS TPQ (gas)
SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (gas)
SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: No
REACTIVE: Yes
SUDDEN RELEASE: Yes
SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): except non-aerosol forms
OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS TQ (gas)
STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.
EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
T Toxic
C Corrosive
EC Classification may be inconsistent with independently-researched data.
DANGER/HAZARD SYMBOL:
T Toxic

EC RISK AND SAFETY PHRASES:

R 23	Toxic by inhalation.
R 35	Causes severe burns.
S 1/2	Keep locked-up and out of reach of children.
S 9	Keep container in a well-ventilated place.
S 26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CONCENTRATION LIMITS:

C>=5%	T; C R 23-35 1%<=C<=C<=C<=C