Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Hydrogen fluoride	**Trade Name:**	Hydrogen fluoride
Product Use:	Many.		
Chemical Name:	Hydrogen fluoride	**Synonym:**	Anhydrous hydrofluoric acid, Hydrofluoride, Fluorohydric acid gas, Hydorfluoric acid gas, HF-A.
Chemical Formula:	HF	**Chemical Family:**	Inorganic Acid Anhydride
Telephone:	**Emergencies:** * 1-800-363-0042	**Supplier /Manufacture:**	Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
		Phone:	905-803-1600
		Fax:	905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Composition and Information on Ingredients

INGREDIENTS	% (VOL)	CAS NUMBER	LD_{50} (Species & Routes)	LC_{50} (Rat, 4 hrs.)	TLV-TWA (ACGIH)
Hydrogen fluoride	100	7664-39-3	Not available.	966 (1 hr)	Ceiling: 3 ppm

3. Hazards Identification

Emergency Overview

DANGER! Toxic, corrosive, oxidizing liquid and gas under pressure. Harmful if inhaled. Causes eye, skin, and respiratory tract burns. May cause liver and kidney damage. Contact with organic or silica materials may cause fire. Contact with water may cause violent reaction. Self-contained breathing apparatus must be worn by rescue workers.

ROUTES OF EXPOSURE: Inhalation. Swallowing. Skin absorption. Skin contact. Eye contact.

THRESHOLD LIMIT VALUE: TLV-TWA Data from 2004 Guide to Occupational Exposure Values (ACGIH). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION:	Overexposure to vapour concentrations moderately above the Threshold Limit Value (TLV) of 3 ppm is irritating to the upper respiratory tract. Intolerable concentrations are in the range of 120 ppm for 1 minute exposure, which results in irritation of the eyes and respiratory tact. Inhalation of high causes choking, coughing, burning of the throat, and severe irritation of the upper respiratory tract; additionally, there is the possibility of pulmonary edema, general lung injury, bronchitis, and death. Symptoms may progress for 1 – 2 days and gradually diminish over 2 – 3 months.
SKIN CONTACT:	May cause severe irritation and chemical burns associated with severe pain and deeply penetrating tissue destruction.. This process of tissue destruction may persist for several days.
SKIN ABSORPTION:	Prolonged or widespread skin contact with the liquid may result in the absorption of harmful amounts of material.
SWALLOWING:	Highly toxic. May cause chemical burns of the mouth, throat, esophagus, stomach, and small bowel with severe abdominal pain, nausea, diarrhea, vomiting, dizziness, weakness and collapse. Large doses of the material may cause central nervous system involvement, with muscle spasms, tremors, and coma.
EYE CONTACT:	May cause pain, tearing, conjunctivitis, and corneal burns. Vapour may be moderately to severely irritating, experienced as excess tear production, discomfort, blinking, and excess redness of the conjunctiva.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Prolonged or repeated exposure may cause decalcification of the bones, nasal congestion, bronchitis, weight loss, anemia, weakness, and stiffness of the joints. Repeated overexposure may also cause damage to the lungs, liver, and kidneys.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its irritating properties, this material may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

Not available.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. Keep patient warm.

SKIN CONTACT:

Immediately flush affected areas with water for at least 15 minutes while removing contaminated clothing and shoes. Keep affected area immersed in water. Discard clothing and shoes. Keep patient warm. Call a physician.

SWALLOWING:

Give at least two glasses of water or milk at once. Do not induce vomiting. Keep patient warm. Call a physician.

EYE CONTACT:

For contact with the liquid, immediately flush eyes throughly with warm water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN:

In case of severe exposure, oxygen should be administered under pressure immediately and continued as long as necessary. Close observations should be continued 24 to 48 hours for pulmonary edema. For skin exposure, the affected areas should be covered with 20% magnesium oxide in glycerin. If the solution was more than 20%, a 10% solution of calcium gluconate should be injected around and underneath the affected area.

5. Fire Fighting Measures

FLAMMABLE :	No.	**IF YES, UNDER WHAT CONDITIONS?**	Not applicable.
FLASH POINT (test method)	Not applicable.	**AUTOIGNITION TEMPERATURE**	Not applicable.
FLAMMABLE LIMITS IN AIR, % by volume:	**LOWER:** Not applicable.	**UPPER:**	Not applicable.

EXTINGUISHING MEDIA:

This material cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus, protective clothing, and eye protection. Immediately cool containers with water spray from maximum distance until cool, then move cylinders away from fire area if without risk. If containers are leaking, reduce vapours with water spray or fog. Reverse flow into cylinders may cause rupture. Shut off leak if without risk. Move containers away from fire area if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARD:

Nonflammable, toxic, corrosive gas. Heat of fire can build pressure in cylinder and cause it to rupture. Vapours are extremely irritating. Contact may cause burns to skin and eyes. No part of cylinder should be subjected to a temperature higher than 52 C. Contact with most metals in the presence of moisture, produces hydrogen.

HAZARDOUS COMBUSTION PRODUCTS:

Not applicable.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Not applicable.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Corrosive, toxic gas. Use self-contained breathing apparatus and protective clothing where needed. Reduce vapours with fog or fine water spray. Reverse flow into cylinder may cause rupture. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Prevent runoff from contaminating surrounding evironment. Corrosive, toxic vapours may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device.

WASTE DISPOSAL METHOD:

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6 m or use a barricade of non-combustible material. This barricade should be at least 1.5 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see Section 16.

For additional information on stroage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to Section 16 for the address and phone number along with a list of other available publications.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Toxic, corrosive high-pressure gas. Do not breathe gas. Do not get vapour in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures to be encountered Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. ***Prevent reverse flow.*** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. ***When returning cylinder to supplier,*** be sure valve is closed, then install valve outlet plug tightly. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST:	Not applicable.
MECHANICAL (general):	Inadequate. See SPECIAL.
SPECIAL:	Use only in a closed system. A corrosion-resistant, forced-draft fume hood is preferred.
OTHER:	See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION:	For concentrations up to 10 times the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times the TLV, a NIOSH/MSHA approved respirator with a full-face piece or self-contained breathing apparatus is recommended. For higher concentration us only self-contained breathing apparatus operated in the pressure demand mode.
SKIN PROTECTION:	Neoprene gloves. Nitrile gloves. Natural rubber gloves.
EYE PROTECTION:	Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE:	Gas.	**FREEZING POINT:**	-83.57°C (-118.4°F)	**pH:**	Not applicable.
BOILING POINT	19.52°C (67.1°F)	**VAPOUR PRESSURE**	103.4 kPa (@ 20°C)	**MOLECULAR WEIGHT:**	20.01 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1)	0.987 @ 20 C	**SOLUBILITY IN WATER,**	Complete.		
SPECIFIC GRAVITY: VAPOUR (air = 1)	1.858	**EVAPORATION RATE** (Butyl Acetate=1):	>1 compared to (Butyl Acetate = 1)	**COEFFICIENT OF WATER/OIL DISTRIBUTION:**	Not applicable.
VAPOUR DENSITY:	0.0032 g/ml @ 19.5 C	**% VOLATILES BY VOLUME:**	100% (v/v).	**ODOUR THRESHOLD:**	Not available.

APPEARANCE & ODOUR: Colourless fuming liquid and gas. Odour: sharp, penetrating. (Strong.)

10. Stability and Reactivity

STABILITY:	Sable.
CONDITIONS OF CHEMICAL INSTABILITY:	None known.
INCOMPATIBILITY (materials to avoid):	Bases, moisture, organic compounds, silica bearing compounds, concrete, aluminum and its alloys, titanium, tin, austenitic stainless steels, tantalum, sodium, metal oxides, glass, acids.
HAZARDOUS DECOMPOSITION PRODUCTS:	Decomposition may produce hydrogen and fluorine or fluorides.
HAZARDOUS POLYMERIZATION:	Will not occur.
CONDITIONS OF REACTIVITY:	None known.

11. Toxicological Information

See section 3.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Hydrogen fluoride, anhydrous

HAZARD CLASS:	IDENTIFICATION #:	PRODUCT RQ:
Class 8: Corrosive material CLASS 6.1: Poisonous material.	UN1052	All

SHIPPING LABEL(s): Corrosive material

PLACARD (when required): Corrosive material

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations.

WHMIS (Canada)

CLASS A: Compressed gas.
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

International Regulations

EINECS Not available.

DSCL (EEC) R23- Toxic by inhalation.

International Lists No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH **2**
FLAMMABILITY **0**
PHYSICAL HAZARD **1**

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-670

PIN-INDEXED YOKE: Not available.

ULTRA-HIGH-INTEGRITY CONNECTION: CGA-638

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

AV-1	Safe Handling and Storage of Compressed Gas
P-1	Safe Handling of Compressed Gases in Containers
P-14	Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmosphere
SB-2	Oxygen-Deficient Atmospheres
V-1	Compressed Gas Cylinder Valve Inlet and Outlet Connections
V-7	Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
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PREPARATION INFORMATION:

DATE: **10/15/2004**

DEPARTMENT: **Safety and Environmental Services**

TELEPHONE: **905-803-1600**

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety nformation, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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