

HYDROFLUORIC ACID

PRODUCT IDENTIFICATION**Chemical Name and Synonyms:** Hydrofluoric acid. Hydrogen fluoride.

Fluorohydric acid.

Chemical Family: Inorganic acid**Chemical Formula:** HF**Product Use:** Laboratory reagent**Manufacturers Name and Address:** Caledon Laboratories Ltd. 40

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Telephone No: (905) 877-0101**Fax No:** (905) 877-6666**Emergency Telephone No:** CANUTEC (613) 996-6666**HAZARDOUS INGREDIENTS OF MATERIALS****Ingredients, %, TLV Units, CAS No:** Hydrofluoric acid, 48 - 51, 3 ppm (as F), 7664-39-3**PHYSICAL DATA****Physical State:** Liquid**Odour and Appearance:** Clear, colourless, fuming corrosive liquid, acrid odour**Odour Threshold (ppm):** 0.04 ppm - 0.13 ppm. Not good warning properties; odour may not provide sufficient warning of lethal concentrations.**Vapour Pressure (mm Hg):** 14 kPa at 20 °C**Vapour Density (Air = 1):** 0.99 at 13.6 °C**Evaporation Rate (Bu ac = 1):** < 1**Boiling Point (degrees C):** 112 °C (40 %); 66 °C (70 %)**Freezing Point (degrees C):** -36 °C**pH:** < 1**Specific Gravity:** ~ 1.15**Coefficient of Water/Oil distribution:** Not available.**SHIPPING DESCRIPTION****UN:** 1790**T.D.G. Class:** 8, (6.1)**Pkg. Group:** II**REACTIVITY DATA****Chemical Stability:** Normally stable. Sensitive to heat and light.**Incompatibility with other substances:** Reacts violently with strong bases. Will dissolve glass, ceramics, metals containing silica, natural gum rubber and leather. Contact with glass, concrete and other silicon-bearing materials yields silicon tetrafluoride gas. Contact with cyanides and sulphides produces highly toxic gases of hydrogen cyanide and hydrogen sulphide. Reacts vigorously with carbonates, releasing carbon dioxide. Corrodes all metals, except lead and platinum, releasing flammable/explosive hydrogen gas. Reaction with arsenic trioxide can be extremely hot. Reacts vigorously with fluorine gas and may burst into flame. Reacts violently with n-phenylazopiperidine, potassium permanganate, bismuthic acid, fluorine, metal oxides and water-reactive materials.**Reactivity:** Do not store in glass. Avoid contact with metals and alkali metals. Avoid generating dust or vapours, avoid all incompatible materials. Keep away from heat and sources of ignition.**Hazardous Decomposition Products:** Emits fumes of HF, hydrogen gas, other toxic compounds.**FIRE AND EXPLOSION DATA****Flammability:** Non flammable, but releases flammable/explosive hydrogen gas in contact with metals or other substances.**Extinguishing Media:** Dry chemical powder. Use water, as spray or fog, very carefully, to cool containers, but avoid direct contact with the chemical; it will cause violent splashing. Fight fire from a safe distance and from upwind. Firefighters must wear full-body encapsulating chemical resistant suit and full face-piece, positive-pressure self-contained breathing apparatus. Containers may explode in a fire.**Flash Point (Method Used):** Not flammable.**Autoignition Temperature:** Not flammable.**Upper Flammable Limit (% by volume):** Not flammable.**Lower Flammable Limit (% by volume):** Not flammable.**Hazardous Combustion Products:** Toxic vapours may be generated when heated. Flammable/explosive gases may be produced.**Sensitivity to Impact:** None identified.**Sensitivity to Static discharge:** None but in some circumstances flammable/explosive gases may be generated which may be ignited by static discharge.**TOXICOLOGICAL PROPERTIES AND HEALTH DATA****Toxicological Data:****LC50:** (rat) 638 ppm/4h; (mouse) 171 ppm/4h**LCLO:** (human) 50 ppm/30 min**Effects of Acute Exposure to Product:** Hydrofluoric acid is very toxic by any exposure route. Concentrations > 7 % are very toxic and corrosive; concentrations 1 % - 7 % are toxic and corrosive; concentrations < 1 % are harmful and very irritating. Exposure by any route of exposure can cause hypocalcemia (depletion of calcium in the body), which if not treated promptly can cause death.**Inhaled:** May be fatal. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, causing burning sensation, coughing, wheezing, shortness of breath. Even weak concentrations of vapour cause irritation; high vapour concentrations cause severe burns to tissue, spasm of larynx and bronchi, and pulmonary edema, which can lead to death. Symptoms may be delayed until hours or days after exposure.**In contact with skin:** Both liquid and vapour can cause deep and excruciatingly painful burns. Burns from strong HF (50 %) are felt immediately; weaker solutions (25 % - 50 %) may not be noticed for a few minutes; burns from solutions less than 1 % - 20 % may not be felt for several hours but will still cause severe burns. The acid regenerates itself and keeps penetrating the flesh, stopping only when reaction with calcium in the bones is complete. Serious skin splashes have caused death.**In contact with eyes:** Both liquid and vapour are extremely destructive to eye tissue. Vapours can dissolve in the moisture in the eyes and cause burns. May cause severe damage with corneal scarring.**Ingested:** May be fatal if even small amounts or dilute solutions are swallowed. Very destructive to tissue; causes severe burning, possible perforation of the gastrointestinal tract, and hypocalcemia.

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Effects of Chronic Exposure to Product: The major health hazards of hydrogen fluoride exposure are related to its corrosive properties during acute exposure. There is less risk associated with long-term effects. Fluoride tends to accumulate in the bones and excessive amounts will produce weakening and degeneration of the bone structure (osteosclerosis). There may also be development of fluorosis, with heart, nerve and intestinal problems. Fluorosis may be slowly and partially reversible. May cause liver and kidney damage and CNS depression.

Carcinogenicity: Not classifiable as carcinogenic.

Teratogenicity: Inconclusive data from animal studies. No reports of effects on humans (RTECS No. MW7875000).

Reproductive Effects: Insufficient information available.

Mutagenicity: Insufficient information available.

Synergistic Products: Insufficient information available.

PREVENTIVE MEASURES

Engineering Controls: Local, corrosion-proof, exhaust ventilation required with vapours collected and neutralized with appropriate scrubbers. Total enclosure is probably needed in most operations involving HF liquid.

Respiratory Protection: Up to 30 ppm - NIOSH-approved chemical cartridge respirator with cartridge to protect against hydrogen fluoride, powered air-purifying respirator with cartridge to protect against hydrogen fluoride, gas mask with canister to protect against hydrogen fluoride, supplied-air respirator, or full-facepiece self-contained breathing apparatus. In high or unknown concentrations, as in fire or spill conditions, NIOSH approved respirator or self-contained breathing apparatus.

Eye Protection: Safety goggles and/or face shield. Do not wear contact lenses.

Skin Protection: Natural rubber or neoprene gauntlet gloves. Resistance can vary, and should be evaluated under conditions of use. Sleeve protectors are recommended, and apron, coveralls, boots or other resistant protective clothing sufficient to prevent any contact. Protective clothing must be used specifically for hydrofluoric acid operations, must be clearly marked and differentiated from other protective clothing. Protective clothing must be regularly laundered, checked and maintained. Notify laundry personnel of hazard.

Other Personal Protective Equipment: Safety shower and eye wash fountain readily available in work area.

Leak and Spill Procedure: Evacuate area and restrict access to personnel wearing protective equipment and clothing sufficient to prevent any inhalation of mist or vapours and any contact with skin and eyes (See Preventive Measures). Eliminate all sources of ignition. Stop leak if it is safe to do so. Use water spray to reduce or divert vapours. Do not get water inside containers. Spray the air with 6 M NH₄OH. Dike to contain and prevent entry into sewers, waterways, or confined areas. Spilled product will make floors and surfaces slippery; use caution. Cover with soda ash and slaked lime mixture 50-50. Mix and add to water to form slurry. Scoop up slurry and transfer into containers for disposal. Ventilate area thoroughly. Wash site of spillage thoroughly with soda ash solution. For advice on handling large HF spills contact Transport Emergency Assistance Plan through CANUTEC (emergencies) at 613-996-6666, or Canadian Chemical Producers Association (non-emergencies) 613-237-6215.

Waste Disposal: Dispose of in compliance with local, provincial and federal regulations.

Handling Procedures and Equipment: EXTREMELY CORROSIVE, TOXIC. Use extreme caution in all procedures involving HF. Workers using this chemical must be properly trained in its hazards and its safe use. Do not work alone with this material. Wear appropriate protective clothing and equipment. Avoid contact. Avoid inhalation. When diluting, always add acid to water, slowly, while stirring carefully. Use the smallest amount possible for the purpose in an area with adequate ventilation. When opening HF containers ensure that there are no sources of ignition present and that the work area is well-ventilated. Use non-sparking tools. Do not leave open containers of HF unattended. Empty containers may contain hazardous residues; treat with caution.

Storage Requirements: Do not store in glass. Concentrations of 70 % or less may be stored in polyethylene or PVC. Store in a cool, dry, well ventilated area, out of direct sunlight and away from all sources of ignition and incompatible materials. Keep containers tightly closed. Storage facilities should be made of corrosion-resistant materials, and should have raised sill or ramps. Protect from damage; inspect regularly for signs of damage.

FIRST AID MEASURES**Specific Measures:**

Eyes: Wear gloves to avoid contact. Immediately flush eyes with gently running water for fifteen to twenty (15 to 20) minutes, holding eyelids open during flushing. Avoid flushing contaminated water into unaffected eye. Get medical attention immediately. If medical help is not available within twenty (20) minutes, continue flushing until physician is available. Apply one or two drops of 0.5 % pontocaine hydrochloride if it is available.

Skin: First aider must wear impervious gloves to avoid ANY contact with this chemical. Under running water remove contaminated clothing (including shoes, watches and rings) under running water. IMMEDIATELY flush exposed area with large amounts of warm running water for at least twenty (20) minutes. Flushing will remove surface HF, but not that which has penetrated to deeper tissue. After 5 minutes of flushing with water, immerse the affected skin in 0.13 % benzalkonium chloride solution chilled with ice cubes or apply compresses soaked in iced solution. Change the compresses every 2-3 minutes. Continue until medical treatment is available. An alternative is to use 2.5 % calcium gluconate gel, massaging gel into the site of contact. Apply gel every 15 minutes and massage continuously until medical treatment is available. If neither of these treatments is available, continue flushing with water until medical help is available. Immediately transport victim to an emergency care facility.

Inhalation: Remove to fresh air immediately. Rescuer should take precaution to limit his own exposure. Get medical attention immediately. Give oxygen for breathing difficulty. If breathing has stopped, give artificial respiration. Avoid contact by using mouth guards or shields. If breathing and pulse are absent begin CPR. Stay with casualty until medical assistance is reached. Second rescuer should obtain oxygen equipment and ambulance.

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Ingestion: Do not induce vomiting. DO NOT GIVE BAKING SODA. If casualty is alert and not convulsing, rinse mouth with water and give several vials of 10% calcium gluconate with 1 to 2 glasses of water to dilute the material. Milk, milk of magnesia or egg whites beaten with water may also be used. Get medical attention immediately. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Avoid contact with emesis.

Note to physician: For burns of large areas, (greater than 25 in²), for ingestion and for significant inhalation exposure, severe systemic effects may occur. Monitor and correct for hypocalcemia, cardiac arrhythmias, hypomagnesemia and hyperkalemia. In some cases renal dialysis may be indicated. For certain burns, especially of the digits, use of intra-arterial calcium gluconate may be indicated. Treat as chemical pneumonia. Monitor for hypocalcemia. 2.5 % calcium gluconate in normal saline by nebulizer or by IPPB with 100 % oxygen may decrease pulmonary damage. Bronchodilators may also be administered.

REFERENCES USED

Budavari: The Merck Index, 12th ed., 1997

CCINFO disc: Cheminfo

Royal Society of Chemistry: Chemical Safety Data Sheets, Vol. 3, 1990

Sax, Lewis: Hawleys Condensed Chemical Dictionary, 11th ed., 1987

Suppliers Material Safety Data Sheets:

ADDITIONAL INFORMATION

Date Issued: 10-Mar-89

Revision: Jan 2014

Proposed WHMIS Designation: D1A; D2A; E

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