SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS and the Global Harmonization Standard

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: COMMON OXIDE ETCH

SYNONYMS: COE
CHEMICAL FAMILY NAME: Ammonium Fluoride Solution
FORMULA: H_2O + NH4F + HF

Document Number**:** 70473
PRODUCT USE: Various

IN U.S. MANUFACTURED/SUPPLIED BY:
ADDRESS: 13546 North Central Expressway, MS 301
Dallas, TX 75243-1920
EMAIL ADDRESS FOR PRODUCT INFORMATION: sds@airliquide.com
EMERGENCY PHONE: CHEMTREC: (U.S., Canada/ Puerto Rico) 1-800-424-9300 (24 hrs)
(International) +1-703-527-3887 (collect-24 hrs)
BUSINESS PHONE: General SDS Information +1 713-896-2896 (8 am to 5 pm U.S. Central Time)

NOTE: ALL United States Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, Canadian WHMIS required information is included in appropriate sections based on the U.S. ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the countries listed above and the SDS contains all the information required by the Canadian WHMIS [Controlled Products Regulations].

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION CLASSIFICATION: This product has been classified in accordance with the Global Harmonization Standard.

Classification: Skin Corrosion Cat. 1A, Acute Oral Toxicity Cat. 3, Acute Dermal Toxicity Cat. 3, Acute Inhalation Toxicity Cat. 3
Signal Word: Danger
Hazard Statement Codes: H314, H301, H311, H331
Precautionary Statements: P260, P264, P270, P271, P280, P301 + P330 + P331, P303 + P361 + P353, P304 + P340, P305 + P351 + P338 + P310, P321, P363, P403 + P233, P405, P501
Hazard Symbols/Pictograms: GHS05, GHS06


See Section 16 for full text of Hazard and Precautionary Statements

EMERGENCY OVERVIEW: Product Description: This product is a clear to light-yellow, toxic and corrosive solution with an ammonia-like odor. **Health Hazards:** This product is highly corrosive by all routes of exposure. Burns may not be immediately harmful or painful. May be toxic by inhalation, ingestion and skin contact. May be fatal if ingested or inhaled. Eye contact may cause blindness. Repeated low concentration inhalation may cause permanent damage to the respiratory system. Repeated low level skin exposure may cause dermatitis. **Fire Hazards:** This product is not flammable. If involved in a fire, this product may decompose to produce fluoride compounds and other toxic substances. **Reactivity Hazards:** This product may react with water to give off a small amount of heat and hydrogen fluoride gas. There may be a slight build-up of pressure in the container; therefore, the container should be opened slowly. There is a possibility of reaction with metals to form highly flammable hydrogen gas. **Environmental Hazards:** This product can damage contaminated plants and animals. All release to the environment should be avoided. **Emergency Response Considerations:** Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	W/W%	GHS Classification Hazard Statements
Ammonium Fluoride	12125-01-8	35.0-40.0%	Classification: Acute Inhalation Toxicity Cat. 3, Acute Dermal Toxicity Cat. 3, Acute Oral Toxicity Cat. 3 Hazard Statement Codes: H331, H311, H301 Hazard Symbols/Pictograms: GHS06
Hydrofluoric Acid	7664-39-3	4.0-7.0%	Classification: Acute Inhalation Toxicity Cat. 2, Acute Skin Toxicity Cat. 1, Acute Oral Toxicity Cat. 2, Skin Corrosion Cat. 1A Hazard Statement Codes: H330, H310, H300, H314 Hazard Symbols/Pictograms: GHS06, GHS05
Water	7732-18-5	Balance	Classification: Not Applicable

See Section 16 for full text of Ingredient Hazard and Precautionary Statements

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS MATERIAL WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

DESCRIPTION OF FIRST AID MEASURES: Victim(s) must be taken for medical attention. Take copy of label and SDS to physician or other health professional with victim(s). Remove victim(s) to fresh air, as quickly as possible.

INHALATION: If vapors, mists, or sprays are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. If adverse effect continues after removal to fresh air, seek medical attention.

EYE EXPOSURE: If liquid or vapors enter the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Do not interrupt flushing. If adverse effect occurs after flushing, seek medical attention.

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 20 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention if adverse effect occurs after decontamination.

INGESTION EXPOSURE: If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Rinse mouth with water immediately. Do NOT give water, as this may result in reaction. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, and respiratory problems may be aggravated by over-exposure to this product.

IMPORTANT SYMPTOMS AND EFFECTS: See Sections 3 (Hazard Identification) and 11 (Toxicological Information).

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate overexposure. Provide oxygen, if necessary. Pulmonary function tests, chest X-rays, and nervous system evaluations may prove useful. Consultation with an ophthalmologist is recommended if eye exposure leads to tissue damage. All persons providing treatment must be gloved. If symptoms of fluoride poisoning develop, treatment recommendations for contamination are as follows:

Skin Contact: After 20 minute water flush (if flush has not yet been done), apply calcium gluconate gel (2.5% concentration) until pain has subsided, but not longer than 30 minutes. If pain lasts longer than 20 minutes, proceed with calcium gluconate injections.

Eye Contact: After 20 minutes water flush (if flush has not been done), flush eyes with 1% calcium gluconate gel in normal, sterile saline.

Inhalation: Provide 100% oxygen, followed by inhalation of a mist containing 2.5% calcium gluconate in saline solution. Watch for pulmonary edema.

Ingestion: Gastric lavage with lime water or milk.

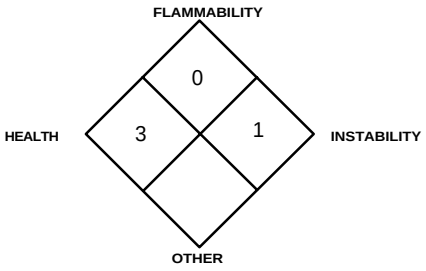
5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume): Not applicable.

NFPA RATING



FIRE EXTINGUISHING MEDIA: In the event of a fire, use suppression methods for surrounding materials (e.g., dry chemical, carbon dioxide, foam, any “ABC” class extinguisher).

UNSUITABLE FIRE EXTINGUISHING MEDIA: Water should only be used for cooling of containers only due to potential reaction.

SPECIAL FIRE AND EXPLOSION HAZARDS: This product is corrosive and presents a severe contact hazard to firefighters. The Ammonium Fluoride component in this product decomposes at 240°C (464°F) and above to form very toxic and extremely corrosive hydrogen fluoride gas. Additional products of thermal decomposition include hydrogen fluoride, irritating and toxic ammonia, and nitrogen oxides. Well-sealed containers may rupture violently when exposed to fire or excessive heat for sufficient time. This solution can react with metals to produce flammable hydrogen gas.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

ADVICE TO FIRE-FIGHTERS: Move containers from fire area if it can be done without risk to firefighters. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. All contaminated equipment must be thoroughly cleaned with a neutralizer suitable for fluoride compounds and rinsed with water before such equipment is returned to service.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: If a release occurs, evacuate area immediately! Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a large spill, clear the affected area, protect people, and respond with trained personnel. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Only use water spray to reduce vapors or divert vapor cloud drift.

6. ACCIDENTAL RELEASE MEASURES (Continued)

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES (continued): Avoid allowing water runoff to contact spilled material. Decontaminate the area thoroughly. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666). The atmosphere must have levels of the components of this product lower than those listed in Section 8, (Exposure Controls, Personal Protection), if applicable, and at least 19.5 percent oxygen before personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA).

PERSONAL PROTECTIVE EQUIPMENT: Proper protective equipment should be used. See below for specific information.

ALL Spills: Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit**.** The minimum level of personal protective equipment for all releases must be **Level B: triple-gloves (fire-retardant gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus. A fire retardant suit must be worn over the chemical resistant suit.**

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Spills: Avoid contact with water. Absorb spilled liquid with polypads or other suitable absorbent materials. DO NOT USE CLAY OR OTHER SILICA-BASED ABSORBING MATERIALS. Neutralize residue with sodium bicarbonate, soda ash, slaked lime or other appropriate neutralizing agent. Place spilled material in appropriate container for disposal, sealing tightly. Remove all residues before decontamination of spill area. Purge equipment with inert gas prior to reuse.

Spills in Hoods: Decontamination of all interior hood surfaces may be required after the above procedures for small spills have been followed. If the HEPA filter of a hood is contaminated, the unit must be labeled "Do not use-contaminated" and the filter must be changed and disposed of properly as soon as possible by trained personnel wearing protective equipment. Protective goggles should be cleaned with an alcohol wipe after the cleanup.

Large Spills: Access to the spill area should be restricted. Spread should be limited by diking spill area. Avoid contact with water. Absorb spilled liquid with polypads or other suitable absorbent materials. DO NOT USE CLAY OR OTHER SILICA-BASED ABSORBING MATERIALS. Neutralize residue with sodium bicarbonate, soda ash, slaked lime or other appropriate neutralizing agent. Monitor the surrounding area for oxygen levels. The atmosphere must have at least 19.5 % oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

All Spills: Place all spill residues in a double plastic bag or other containment and seal. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization is complete. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion and collect. Dispose of recovered material and report spill per regulatory requirements.

ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage.

REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: ALL AREAS WHERE THIS PRODUCT IS USED SHOULD CONTAIN INSTANT ACTING SHOWERS IN EVENT OF CONTAMINATION. **Calcium gluconate gel should be readily accessible in areas where potential exposure to this product exists.** All employees who handle this material should be trained to handle it safely. Minimize all exposures to this substance. As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing vapors or mists generated by this product. Use in a well-ventilated location, segregated from other materials and operations. Empty containers may contain residual liquid or vapors; therefore, empty containers should be handled with care. There may be a slight build-up of pressure in the container; therefore, the container should be opened slowly.

STORAGE AND HANDLING PRACTICES: DO NOT STORE IN GLASS CONTAINERS. Do not use steel, nickel, or aluminum containers for storage. Use in a well-ventilated location, segregated from other materials and operations. Keep away from water, heat, sparks, and other sources of ignition. Use non-sparking tools. Bond and ground containers during transfers of material. Containers of this product must be properly labeled. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion-resistant materials. Post warning and “NO SMOKING” signs in storage and use areas, as appropriate. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

SPECIFIC END USE(S): This product has various uses. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly, before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

VENTILATION AND ENGINEERING CONTROLS: This product should be used in a fume hood or glove box or closed chemical dispensing system designed by competent individual. Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits provided in this section, if applicable.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

VENTILATION AND ENGINEERING CONTROLS (continued): Use a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Exhaust system in manner consistent with prevention of release to atmosphere. An eyewash and safety shower should be readily accessible.

OCCUPATIONAL/WORKPLACE EXPOSURE LIMITS/GUIDELINES:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Ammonium Fluoride The following exposure limits are for Fluorides, as F	12125-01-8	2.5	NE	2.5	NE	2.5	NE	NE	DFG MAKs: TWA = 1 (inhalable fraction) skin PEAK = 4•MAK, 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C Carcinogen: TLV-A4
Hydrofluoric Acid	7664-39-3	0.5 (skin, as F)	2 (ceiling) skin, as F	3 (as F)	6 ppm (Vacated 1989 PEL	3	6 (ceiling) 15 min.	30	DFG MAKs: TWA = 1 PEAK = 2•MAK, 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C
Water	7732-18-5	NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established.

PERSONAL PROTECTIVE EQUIPMENT:

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I, beginning at 1910.132, including the Respiratory Protection Standard (29 CFR 1910.134), the Eye Protection Standard (29 CFR 1910.133), the Hand Protection Standard (29 CFR 1910.138), and Foot Protection (29 CFR 1910.136) or the Canadian CSA Standard Z94.4-M1982, Selection, Care and Use of Respirator, the *CSA Standard Z94.3-02,* Industrial Eye and Face Protectors, *and the Canadian CSA Standard Z195-02,* Protective Footwear *. Please reference applicable regulations and current standards for relevant details.*

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below limits listed above. In instances where inhalable mists or sprays of product may be generated, and respiratory protection is necessary, use only respiratory protection authorized in the U.S. Federal OSHA, or equivalent U.S. State standards, and standard of Canada. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, SAR with auxiliary self-contained air supply is required under U.S. OSHA's Respiratory Protection Standard. The following NIOSH Respiratory Guidelines for Hydrofluoric Acid in Air are provided for additional information:

HYDROFLUORIC ACID CONCENTRATION	**RESPIRATORY EQUIPMENT**
Up to 30 ppm	Chemical cartridge respirator or powered air-purifying respirator with cartridges, or gas mask with canister or a Supplied Air Respirator (SAR)
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive-pressure, full facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
Escape	Gas mask or mouth-piece respirator with Hydrogen Fluoride cartridges or escape-type SCBA should be used.

EYE PROTECTION: Use approved safety goggles or safety glasses with side shields worn with a face shield to prevent liquid splash contact. If necessary, refer to U.S. OSHA and Canadian Standards.

HAND PROTECTION: Recommended gloves are butyl rubber, Silver Shield/4H™, (polyethylene/ethylene vinyl alcohol), Trellchem™ HPS, Trellchem™ VPS, Tychem™ SL, Saranex™, Tychem™ F, Tychem™, Responder™, Tychem ™ TK. Due to severe skin contact hazard, do not use natural rubber, nitrile rubber, polyethylene, polyvinyl alcohol, polyvinyl chloride gloves. Use triple gloves for spill response. If necessary, refer to U.S. OSHA and Canadian Standards.

BODY PROTECTION: When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. An apron or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA and Canadian Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquid.
COLOR: Clear to light-yellow.
ODOR: Ammonium-like.
ODOR THRESHOLD: 0.042 ppm (Hydrofluoric Acid)
VAPOR DENSITY (water = 1): < 1.0
PERCENT VOLATILE BY VOLUME: Not available.
BOILING POINT: > 100°C (> 212°F)
FREEZING/MELTING POINT: > 10°C (> 50°F)
SPECIFIC GRAVITY (water = 1): 9.32 lb/gal
pH @ 25°C: 4.5-6.5
SOLUBILITY IN WATER: Soluble.
MOLECULAR WEIGHT: Not applicable for mixture.
EVAPORATION RATE (n-BuAc = 1): < 1
EXPANSION RATIO Not applicable.
SPECIFIC VOLUME: Not applicable.
LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not determined.
VAPOR PRESSURE: Not determined.
HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn blue-purple upon contact with this product. The odor may also be a characteristic property in event of an accidental release.

10. STABILITY and REACTIVITY

REACTIVITY/CHEMICAL STABILITY: Stable at standard temperatures and pressures. Contact with water will generate hydrogen fluoride. Contact with some metals may generate hydrogen gas (see further in this section for more information).

DECOMPOSITION PRODUCTS: *Combustion:* Products of thermal decomposition include fluorides, and ammonia compounds. *Hydrolysis:* Hydrofluoric acid.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with strong oxidizing agents, strong reducing agents and chlorine trifluoride. Due to the presence of the Hydrofluoric Acid component, this product may also not be compatible with bases and can react violently. Hydrofluoric Acid can dissolve metals containing silica. Hydrofluoric Acid can dissolve glass, ceramics, metals containing silica, natural rubber and leather. Hydrofluoric Acid also reacts with many other materials such as cyanogen fluoride, sodium (with aqueous acid), methanesulfonic acid, acetic anhydride, chlorosulfonic acid, ethylene diamine, ethylene imine, oleum, propylene oxide, vinyl acetate, sodium tetrafluoro silicate, n-phenyl azo piperdine. Due to the presence of the fluoride compounds in this product, this solution must be considered incompatible with glass, and other silica-based compounds.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to water and extreme temperatures.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to extreme temperatures.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: This product is corrosive and toxic by all routes of exposure. The symptoms of overexposure to this product are as follows:

INHALATION: If vapors, mists or sprays of this product are inhaled, moderate to severe irritation or burns to the nose, throat, and lungs can occur. Symptoms can include coughing, tightness of the chest, and difficulty breathing. Inhalation over-exposure can cause pulmonary edema (a potentially life threatening condition), and symptoms may be delayed by hours or days. Repeated inhalation over-exposure may cause obstructive lung disease. Severe inhalation over-exposures can lead to hypocalcemia, a life-threatening lowering of serum calcium in the body. Inhalation of high concentrations may be fatal. Repeated exposures to vapor and mist from this product may also cause the breakdown of tooth enamel.

CONTACT WITH SKIN or EYES: Depending on the duration and concentration of over-exposure, eye contact will cause irritation, scarring, blistering, ulceration, disintegration, and blindness. Depending on the duration and concentration of over-exposure, skin contact may cause reddening, scarring, chemical burns, and ulceration. Burns may not be immediately painful or visible. Repeated skin over-exposures can result in dermatitis (drying, cracking, and inflammation of the skin).

SKIN ABSORPTION: This product can penetrate the skin, causing destruction of the deep tissue layers, including bone tissue. This damage to the body's tissues may continue for days, as the fluoride ion reacts with the calcium in the skin and bone. Severe skin-contact exposures (especially when the skin contamination exceeds 160 cm^2) can lead to hypocalcemia, a life-threatening lowering of serum calcium in the body.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	1

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

INGESTION: Ingestion is not anticipated to be a likely route of occupational exposure. If this product is swallowed, it will irritate and burn the mouth, throat, esophagus, and other tissues of the digestive system. Symptoms may include pain, vomiting, diarrhea, and collapse. Aspiration of the product ("breathing" of liquid into lungs) during ingestion or vomiting may cause severe and fatal lung damage. The symptoms of lung damage, such as breathing difficulties may be delayed for several hours. Death may occur within hours of severe poisoning, or may be delayed for days or weeks. Small doses (less than 10 mL) may be fatal.

INJECTION: Accidental injection of this product, via laceration or puncture by a contaminated object, may cause pain and irritation in addition to the wound.

OTHER HEALTH EFFECTS: Chronic exposure to fluoride compounds may cause deposition of fluoride in tendons, ligaments and muscles, resulting in crippling effects. Chronic exposure may also result in kidney damage and adverse effects on the central nervous system. Over-exposure to this product by all routes may result in severe lowering of serum calcium in blood and tissues, which will have adverse physiological effects, including functioning of muscles.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this product may cause the following health effects**:**

ACUTE: This product is corrosive and can cause severe irritation or burns by all routes of exposure. Burns may not be immediately visible or painful. This product is also toxic and may be fatal by inhalation, ingestion or if a large area of skin is contaminated. Severe exposure to this product may result in hypocalcemia, which can be fatal unless treated. Hypocalcemia is possible in all instances of inhalation or ingestion or whenever exposure has caused large areas of burns. Severe inhalation and ingestion over-exposure may be fatal.

11. TOXICOLOGICAL INFORMATION (Continued)

HEALTH EFFECTS OR RISKS FROM EXPOSURE (continued):

CHRONIC: Persistent irritation and dermatitis (drying, cracking, and inflammation of the skin) may result from repeated over-exposures to this product. Chronic exposure to fluoride compounds may cause deposition of fluoride in tendons, ligaments and muscles, resulting in crippling effects. Chronic exposure may also result in kidney damage and adverse effects on the central nervous system.

TARGET ORGANS: ACUTE: Skin, respiratory system, eyes, central nervous system, bones. CHRONIC: Skin, respiratory system, bones, ligaments, tendons, central nervous system, kidneys.

TOXICITY DATA: The following toxicology data are for components of this product greater than 1%.

AMMONIUM FLUORIDE:

LD_{50} (Intraperitoneal-Rat) 31 mg/kg

LDLo (Subcutaneous-Frog) 280 mg/kg

TCLo (Inhalation-Rat) 1600 μg/m^3/6 hours/39 weeks-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Musculoskeletal: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: phosphatases

HYDROFLUORIC ACID:

Standard Draize Test (Eye-Human) 50 mg: Severe

TCLo (Inhalation-Man) 100 mg/m^3/1 minute: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified, conjunctive irritation; Lungs, Thorax, or Respiration: cough

TDLo (Oral-Man) 143 mg/kg: Cardiac: arrhythmias (including changes in conduction); Vascular: BP lowering not characterized in autonomic section; Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis)

LCLo (Inhalation-Human) 50 ppm/30 minutes

LC_{50} (Inhalation-Rat) 1276 ppm/1 hour: Sense Organs and Special Senses (Eye): lacrymation; Behavioral: changes in motor activity (specific assay); Gastrointestinal: changes in structure or function of salivary glands

LC_{50} (Inhalation-Monkey) 1774 ppm/1 hour: Behavioral: coma; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: other changes

LC_{50} (Inhalation-Mouse) 342 ppm/1 hour: Sense Organs and Special Senses (Eye): corneal damage, effect, not otherwise specified; Lungs, Thorax, or Respiration: dyspnea

LC_{50} (Inhalation-Guinea Pig) 4327 ppm/15 minutes: Sense Organs and Special Senses (Eye): lacrymation; Lungs, Thorax, or Respiration: respiratory depression; Nutritional and Gross Metabolic: weight loss or decreased weight gain

HYDROFLUORIC ACID (continued):

LCLo (Inhalation-Rabbit) 260 mg/m^3/7 hours

TCLo (Inhalation-Rat) 300 μg/m^3/24 hours/22 weeks-continuous: Behavioral: alteration of classical conditioning; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase

TCLo (Inhalation-Rat) 252 μg/m^3/6 hours/weeks-intermittent: Blood: changes in erythrocyte (RBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: monoamine oxidase, Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases

TCLo (Inhalation-Rat) 470 μg/m^3/4 hours: female 1-22 day(s) after conception: Reproductive: Fertility: pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea), post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TCLo (Inhalation-Rat) 4980 μg/m^3/4 hours: female 1-22 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death

LDLo (Intraperitoneal-Rat) 25 mg/kg

LDLo (Skin-Mouse) 500 mg/kg: Peripheral Nerve and Sensation: spastic paralysis with or without sensory change; Behavioral: tremor; Lungs, Thorax, or Respiration: respiratory depression

LDLo (Subcutaneous-Frog) 112 mg/kg

TDLo (Subcutaneous-Rat) 364 mg/kg/26 weeks-intermittent: Kidney, Ureter, Bladder: other changes; Musculoskeletal: changes in teeth and supporting structures; Related to Chronic Data: death

DNA Damage (Inhalation-Drosophila melanogaster) 1300 ppb/6 weeks

Sex Chromosome Loss and Non-disjunction (Inhalation-Drosophila melanogaster) 2900 ppb

Cytogenetic Analysis (Inhalation-Rat) 1 mg/m^3/6 hours/24 days-intermittent

CARCINOGENIC POTENTIAL OF COMPONENTS: Components of this product are listed by agencies tracking carcinogenic potential, as follows:

AMMONIUM FLUORIDE and HYDROFLUORIC ACID (as Fluoride Compounds): ACGIH TLV-A4: (Not Classifiable as a Human Carcinogen agents which cause concern that they could be carcinogenic for humans, but which cannot be conclusively assessed because of lack of data)

IRRITANCY OF PRODUCT: This product is severely irritating and corrosive to contaminated tissue, especially after prolonged contact.

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be skin or respiratory sensitizers.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity**:** This product is not expected to cause mutagenic effects in humans. The available information does not suggest that the Hydrofluoric Acid component is mutagenic. In one limited study, positive results (sister chromatid exchanges in peripheral blood lymphocytes) were obtained in a small number of employees exposed to Hydrofluoric Acid and several other chemicals. In general, fluorides are only mutagenic at doses that are highly toxic to cells and whole animals.

Embryotoxicity/Teratogenicity/Reproductive Toxicity: The components of this product are not reported to cause embryotoxic, teratogenic or reproductive toxicity effects in humans.

ACGIH BIOLOGICAL EXPOSURE INDICES: The following ACGIH Biological Exposure Indices (BEIs) have been determined for the components of this product.

CHEMICAL/DETERMINANT	SAMPLING TIME	BEI
FLUORIDES: • Fluorides in urine	• Prior to shift • End of shift	• 3 mg/g creatinine • 10 mg/g creatinine

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY: This product has not been tested for mobility in soil.

PERSISTENCE AND BIODEGRADABILITY: This product has not been tested for persistence or biodegradability. It is expected that this material will be degraded over time into other organic compounds. Rapid volatilization from soils is anticipated.

BIO-ACCUMULATION POTENTIAL: This product has not been tested for bio-accumulation potential.

ECOTOXICITY: This product has not been tested for aquatic or animal toxicity. All release to terrestrial, atmospheric and aquatic environments should be avoided. The following aquatic toxicity data are available for the Hydrofluoric Acid component.

HYDROFLUORIC ACID:

Threshold concentration for fresh and saltwater fish = 1.5 ppm.

HYDROFLUORIC ACID (continued):

Lethal - fish time period not specified/ /fresh water = 60 ppm

OTHER ADVERSE EFFECTS: This material is not expected to have any ozone depletion potential.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Shipment of wastes must be done with appropriately permitted and registered transporters.

DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55-gallon poly waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials.

U.S. EPA WASTE NUMBER: Wastes from this product should be tested to see if they meet D002 (Waste Characteristic-Corrosivity).

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

UN IDENTIFICATION NUMBER: UN 2922
PROPER SHIPPING NAME: Corrosive liquid, toxic, n.o.s (Ammonium Fluoride, Hydrofluoric Acid)
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive); 6.1 (Toxic)
PACKING GROUP: II
DOT LABEL(S) REQUIRED: Class 8 (Corrosive); Class 6.1 (Toxic)
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 2008: 154
MARINE POLLUTANT: The components of this product are not specifically designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

UN IDENTIFICATION NUMBER: UN 2922
PROPER SHIPPING NAME: Corrosive liquid, toxic, n.o.s (Ammonium Fluoride, Hydrofluoric Acid)
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive); 6.1 (Toxic)
PACKING GROUP: II
HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive); Class 6.1 (Toxic)
SPECIAL PROVISIONS: 16
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0.5
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 1
MARINE POLLUTANT: Components of this product are not specifically designated Marine Pollutants.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA): This product is classified as dangerous goods under the rules of IATA.

UN IDENTIFICATION NUMBER: UN 2922
PROPER SHIPPING NAME: Corrosive liquid, toxic, n.o.s (Ammonium Fluoride, Hydrofluoric Acid)
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive), 6.1 (Toxic)
PACKING GROUP: II
EXCEPTED QUANTITIES: E2
PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION: 851
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG: 1 L
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: Y840
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG: 0.5 L
CARGO AIRCRAFT ONLY PACKING INSTRUCTION: 855
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG: 30 L
SPECIAL PROVISIONS: A3
ERG CODE: 8P

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Ammonium Fluoride	No	Yes	No
Hydrofluoric Acid	Yes	Yes	Yes

15. REGULATORY INFORMATION (Continued)

ADDITIONAL UNITED STATES REGULATIONS (continued):

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE THRESHOLD PLANNING QUANTITY (TPQ): Hydrofluoric Acid = 100 lb (45.4 kg)

U.S. SARA SECTION 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (RQ): Hydrofluoric Acid = 100 lb (45.4 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): Ammonium Fluoride = 100 lb (45.4 kg); Hydrofluoric Acid = 100 lb (45.4 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): Ammonium Fluoride = 100 lb (45.4 kg); Hydrofluoric Acid = 100 lb (45.4 kg)

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: No

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS:

- Hydrofluoric Acid, Ammonium Fluoride and the reaction product, Ammonium Fluoride (as fluoride compounds) are subject to the reporting requirements of CFR 29 1910.1000.
- Hydrofluoric Acid (concentrations of greater than 50%) is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Planning Quantity under this regulation is 1000 lb (454 kg).
- Hydrofluoric Acid is subject to the regulations of the Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119). Hydrofluoric Acid has a Threshold Quantity of 1000 lb (454 kg) under this regulation.
- This product does not does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Hydrofluoric Acid (concentrations of greater than 50%) is listed as Regulated Substances per 40 CFR, Part 68 of the Risk Management for Chemical Release Prevention. The Threshold Planning Quantity under this regulation is 1000 lb (454 kg).
- Ammonium Fluoride is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. In addition, the Hydrofluoric Acid component is also designated as a hazardous substance under the Federal Water Pollution Control Act and the Clean Water Act Amendments of 1977 and 1978. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The components of this product are not on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are on the CEPA Priorities Substances Lists, as follows: Hydrofluoric Acid (as fluoride compounds) are considered “Toxic” and on the First Priorities Substance List.

CANADIAN WHMIS REGULATIONS: This product is classified as a Controlled Product, Hazard Classes E (Corrosive) D1A (Immediate Acute Toxicity) and D1B (Chronic Toxic Effects) as per the Controlled Product Regulations.

16. OTHER INFORMATION

GLOBAL HARMONIZATION SYSTEM CLASSIFICATION:

Classification: Skin Corrosion Category 1A, Acute Oral Toxicity Category 3, Acute Dermal Toxicity Category 3, Acute Inhalation Toxicity Category 3

Signal Word: Danger

Hazard Statements: H314: Causes severe skin burns and eye damage. H301: Toxic if swallowed. H311: Toxic in contact with skin. H331: Toxic if inhaled.

Precautionary Statements:

Prevention: P260: Do not breathe gas/mist/vapours/spray. P264: Wash contaminated tissues after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves, clothing, eye protection and face protection.

Response: P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340 + P312: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. P321: Specific treatment (remove from exposure and treat symptoms). P362: Take off all contaminated clothing and wash before reuse.

Storage: P403 + P233: Store in a well-ventilated place. Keep container tightly closed. P405: Keep locked-up.

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Hazard Symbols: GHS05, GHS06

16. OTHER INFORMATION (Continued)

MIXTURES: When two or more chemicals are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for this product before you use the product. Consult an Industrial Hygienist or

other trained person when you make your safety evaluation of the end product. Remember all chemicals have properties that can cause serious injury or death.

REVISION INFORMATION: New

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 1961, Hilo, HI 96721
800-441-3365
Fax on Demand**:** 1-800/231-1366