

Hydrofluoric Acid

Safe Handling Guideline

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URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/chemsafetyGuideHydrofluoricAcid.pdf>

Synonyms

Hydrogen fluoride solution, HF, fluorohydric acid, fluoric acid

Reactivity and Physical Concerns

Incompatible with strong bases, metals, glass, leather, water, alkalis, concrete, silica, sulfides, cyanides, and carbonates. Violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials. Reaction with metals may form flammable hydrogen gas. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face-piece operated in the pressure demand or other positive pressure mode. Keep upwind of fire. Use water or carbon dioxide on fires in which hydrofluoric acid is involved; halon or foam may also be used. In case of fire, the sealed containers can be kept cool by spraying with water. Avoid getting water in tanks or drums; water can cause generation of heat and spattering. In contact with air, the acid gives off corrosive fumes which are heavier than air. Do not store in glass containers. Light sensitive.

Exposure Hazards

Routes of Exposure

Inhalation, ingestion, skin contact, eye contact

Extremely hazardous liquid and vapor. Causes severe burns that may not be immediately painful or visible. May be fatal if swallowed or inhaled. Liquid and vapor can burn skin, eyes, and respiratory tract. Causes bone damage.

Severely corrosive to the respiratory tract. May cause sore throat, coughing, labored breathing, and lung congestion/inflammation. If ingested may cause sore throat, abdominal pain, diarrhea, vomiting, severe burns of the digestive tract, and kidney dysfunction. Skin contact causes serious skin burns that may not be immediately apparent or painful. Symptoms may be delayed 8 hours or longer. The fluoride ion readily penetrates the skin causing destruction of deep tissue layers and bone. Corrosive to the eyes. symptoms include redness, pain, blurred vision, and permanent eye damage; blindness may occur.

Chronic Exposure

Intake of more than 6 mg of fluorine per day may result in fluorosis, bone, and joint damage. Hypocalcemia and hypomagnesemia can occur from absorption of fluoride ion into blood stream.

First Aid

If exposed through inhalation, if patient is unconscious, give artificial respiration or use inhalator. Keep patient warm and resting. Obtain medical attention immediately. **If swallowed, do not induce vomiting**, give large quantities of water. Never give anything by mouth to an unconscious person. Obtain medical attention immediately. **If skin contact occurs**: 1) Remove the victim from the contaminated area and immediately place him under a safety shower or wash with copious amounts of water. 2) Remove all contaminated clothing. Handle all HF-contaminated material with gloves made of appropriate material, such as PVC or neoprene. 3) Keep washing

with large amounts of water for a minimum of 15 minutes. 4) Have someone make arrangements for medical attention while you continue flushing the affected area with water. 5) Obtain medical attention immediately for all burns regardless of how minor they may appear initially. **If eye contact occurs** irrigate eyes for at least 30 minutes with copious quantities of water, keeping the eyelids apart and away from eyeballs during irrigation. 2) Obtain medical attention immediately, preferably from an eye specialist. 3) Place ice pack on eyes until reaching emergency room.

Medical treatment will involve the use of either topical or subcutaneous administration of calcium gluconate or other medicines that will bind the fluoride to stop its corrosive and toxic effects.

(See [Chemical Safety: Accidental Exposure Requirements](#) [SLAC-I-730-0A09S-041].)

Exposure Limits

- Permissible exposure limit: 2 mg/m³; 3 ppm (OSHA TWA)
- NIOSH recommended exposure limit: 2.5mg/m³; 3 ppm (TWA)
- Immediately dangerous to life and health: 30 ppm

Exposure Controls

Engineering Controls

Local exhaust ventilation or breathing protection is required. Secondary containment of all storage and use is required.

Administrative Controls

Procedures should be developed for the safe use and handling of hydrofluoric acid in all applications. ESHQ can provide information and guidance. Depending upon quantities, certain regulatory permits and/or registrations may be required. Personnel working with the materials must receive detailed training on the hazards, safe use, and emergency procedures.

Personal Protective Equipment

Avoid all contact with substance. Prevent skin/eye contact through the use of impervious gloves, clothing, boots, apron, and eye goggles or full face shield. If the airborne exposure limit may be exceeded and engineering controls are not feasible wear a NIOSH-approved self-contained breathing apparatus with full face-piece operated in the pressure demand or other positive pressure mode.

Disposal

Material is disposed of as hazardous waste. Contact the Waste Management Group for specific disposal requirements and procedures. Containers and other materials that are contaminated with hydrofluoric acid must also be treated as hazardous waste.

Medical Monitoring (if applicable)

Initial physical examination to detect pre-existing conditions and establish a baseline for future monitoring including eyes, respiratory tract, central nervous system, skeletal system, kidneys, urinalysis, pelvic roentgenogram, 14"x17" chest roentgenogram, FVC and FEV. All tests should be conducted on an annual basis, with the exception of the radiological examination of the pelvis which should be conducted only when medically indicated.

Emergency Response

In the event of a spill that poses a threat to health and/or the environment, immediately evacuate the area and call 911. Then call SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone) and notify your supervisor.

For other spills, notify your supervisor then SLAC Site Security; these may be cleaned up with appropriate spill response supplies by trained personnel who have been authorized via work planning and control. (See [Spills: Response, Cleanup, and Reporting Procedure](#) [SLAC-I-750-0A16C-006].)

Standards and Regulations

- OSHA. PEL: [29 CFR 1910.1000 Table Z-1](#); Respiratory Protection: [29 CFR 1910.134](#)
- EPA. Release: [40 CFR 355.40](#); Waste: [40 CFR 261.21-261.24](#)
- *California Fire Code*, Chapters 27 through 41 ([24 CCR Part 9](#))

Other References

- NLM. [TOXNET: Toxicology Data Network](#)
- NIOSH. International Chemical Safety Card: Hydrogen Fluoride ([ICSC 0283](#))
- OSHA. [Occupational Health Guideline for Hydrogen Fluoride](#)