



Tufts University Standard Operating Procedures (SOP) for Hydrofluoric Acid

CAS #: 7664-39-3

Synonyms: Aqueous Hydrogen Fluoride, Fluorohydric Acid, Fluoric Acid, HF, AHF.

NFPA 4, HMIS 4-most hazardous poison.

Purpose and Scope

This standard operating procedure (SOP) is created by Tufts Environmental Health and Safety (TEHS) with the goal educating the Tufts community in the proper use of Hydrofluoric Acid. This SOP covers the proper and safe storage, use, and disposal of Hydrofluoric Acid. Under the OSHA required Tufts chemical hygiene plan this chemical is considered highly toxic and requires a registration form be submitted to TEHS. Please see the chemical hygiene link under chemical safety on the TEHS web page to download the registration form.

Toxicity

Hydrofluoric Acid is an inorganic acid which is derived from dissolving hydrogen fluoride in water. HF is noncombustible, colorless. HF possesses an irritating odor at or near the OSHA permissible exposure limit (PEL) of 3 ppm in air. The National Institute for Occupational Safety and Health immediately dangerous to life or health (IDLH) concentration for HF is 30 ppm in air. Hydrofluoric Acid is an extremely corrosive material which attacks all tissues of the body. Contact with the skin results in deep tissue burns that are extremely slow to heal. Contact with dilute (<25%) HF solutions may not be felt until a few hours has past, resulting in major tissue damage. Skin contact with higher concentrations of HF causes immediate and painful burns as well as massive tissue and bone destruction. **Hydrofluoric Acid penetrates the skin, destroys underlying tissues and attacks the bone. Solutions as weak as 1% will still rapidly permeate the skin and severely damage underlying tissues.** Hydrofluoric Acid vapor burns the eyes, ultimately leading to blindness. At concentrations of 10 ppm to 15 ppm HF vapors begin to irritate the eyes. Brief exposure (5 min) to concentrations greater than or equal to 50 ppm can be fatal. Ingestion of HF leads to severe burns of mouth and throat. HF is not a human carcinogen.

Good Practices and Personal Protective Equipment (PPE)

Before purchasing do research into possible substitutes for Hydrofluoric Acid. HF should be purchased in quantities which prevents abnormal amounts in storage. A three month supply or less is a good rule of thumb. Work with quantities that allow for quick and easy clean up by appropriate personnel if a spill occurs. Store Hydrofluoric Acid in original container or polyethylene bottles and in secondary containment. **Do not use glass!** Take specific steps to store HF away from ammonia and other bases. All work with HF must be performed in a chemical fume hood and handled with butyl rubber, neoprene, or **double nitrile gloves**. **When using or pouring HF no area of the skin should be exposed.** When handling solutions of HF, eye protection is a must. Protective equipment should be washed after each use to remove any HF build up. The locations of safety showers and eye wash stations should be clearly marked and easily accessible.

Incompatibilities

HF attacks glass, concrete, and many metals. It also attacks organic materials, leather, natural rubber, and wood. Care should be taken to properly store HF with other acids and always with secondary containment. **Do not store HF in glass containers!** Store HF in its original container.

Spills

If you spill a small amount (minor spill) of Hydrofluoric Acid vacate the lab and notify your supervisor for cleanup assistance. A major spill is any amount of chemical that the lab staff cannot easily and safely clean up without outside assistance. In this case, call your supervisor and 6-6911. **If skin contact occurs, follow instructions for the use of calcium gluconate.** A tube of calcium gluconate gel (antidote) should be readily available. Calcium gluconate works by combining with the HF to form insoluble calcium fluoride, thus preventing the extraction of calcium from tissues, bones, and the resulting burns. Calcium gluconate should be stored in a refrigerator, if possible, and replaced with a fresh supply just prior to its expiration date noted on the tube and packaging. All persons using HF should be aware of the location and proper application of the gel. (See below)

Accidents/Exposures

In the case of skin contact first aid must be started within seconds. If the skin contact is local, immediately remove any contaminated clothing and wash the area with water for 15 min. Apply generous amounts of calcium gluconate gel to the area. Gently massage the gel into the contaminated areas while using gloves. White specks appearing around the burned region indicates the formation of calcium fluoride and that the gel is working. Gently apply the gel for 15 minutes and reapply when the pain flares up. **If larger amounts of HF are spilled, or if HF is spilled in a difficult area to wash, remove clothing and proceed immediately to the nearest safety shower. After showering apply the calcium gluconate gel. It is important to realize that calcium gluconate gel WILL NOT adequately neutralize the affect of HF on tissue by itself. Rinsing with water prior to application of the gel is critical.** Notify medical personnel of what lab the spill took place in. In case of eye contact, rinse the eyes with large amounts of water for a minimum of 5 min. and seek medical attention. **Do not apply calcium gluconate gel to the eyes. If HF is ingested, contact medical help. Do not induce vomiting.** If conscious, have the injured person ingest a glass of milk or milk of magnesia. If vomiting occurs naturally, help the person so they do not choke on the vomit. If HF vapor is inhaled, move the person to fresh air and seek medical attention at once.

Disposal

Hydrofluoric acid meets the requirements of a hazardous waste. Waste Hydrofluoric Acid must be placed in a compatible container (not glass), labeled with the red hazardous waste tags provided by the safety office and the tags need to be properly filled out. On the back of the waste tag, check off the box marked "corrosive." Place the waste container in the satellite accumulation area in secondary containment. Make sure the waste bottle is fitted with a proper screw cap and notify the TEHS for disposal.

References:

-MSDS for Hydrofluoric Acid, 48%, Sigma Aldrich 2011.

-Genium's handbook of safety, health, and environmental data for common hazardous substances. 1999.

-Kristen Forsber, S.Z Mansdorf. *Quick Selection Guide to Chemical protection Clothing 3rd edition*. 1997.

-Ohio State College of Biological Sciences Safety Page. Standard Operating Procedures, College Safety Policy for Hydrofluoric Acid. <http://www.biosci.ohio-state.edu/safety/SOP/SOPSHF.pdf>

- *Occupational Safety and Health Guideline for Hydrogen Fluoride*.

<http://www.osha.gov/SLTC/healthguidelines/hydrogenfluoride/recognition.html>

- *OSHA Safety Hazard Information Bulletin (1): Use of Hydrofluoric Acid in the Petroleum Refining Alkylation Process*. www.Osha.gov

-*FLUORIDE (F⁻ and HF) IN WORKPLACE ATMOSPHERES*. www.Osha.gov

- U.S. Department of Health and Human Services, *NIOSH Pocket Guide to Chemical Hazards*, Publication No. 90-117, Cincinnati, Ohio, June 1990.