

Product Safety Summary

Hydrogen Fluoride and Hydrofluoric Acid

CAS No: 7664-39-3

This Product Safety Summary is intended to provide a general overview of the chemical substance. The information in the summary is basic information and is not intended to provide emergency response information, medical information or treatment information. The summary should not be used to provide in-depth safety and health information. In-depth safety and health information can be found in the Material Safety Data Sheet (MSDS) for the chemical substance.

Names

- Hydrogen Fluoride
- Anhydrous Hydrofluoric Acid
- Hydrofluoric Acid
- Hydrofluoride
- HF
- AHF

Product Overview

Hydrogen Fluoride is primarily used to make refrigerants and other fluorinated organic and inorganic compounds. Diluted with water, it forms hydrofluoric acid solutions which are commonly used in metal surface finishing applications and in some industrial cleaning applications. **Solvay Fluorides, LLC does not sell hydrogen fluoride or hydrofluoric acid directly to consumers and will not knowingly sell to persons that formulate consumer products containing hydrofluoric acid.**

Hydrogen fluoride and hydrofluoric acid (collectively referred to as HF) are used in industrial applications and other processes where workplace exposures can occur. Hydrofluoric acid is occasionally used as a component of some consumer products such as wheel or brick cleaners in concentrations as high as 5% or more. Consumers of these products should avoid exposure to them since exposure to hydrofluoric acid can cause severe health effects. **HF is very toxic and corrosive. Exposures require very specific first aid treatment in order to neutralize the fluoride ion. Failure to properly treat a HF exposure can result in serious health effects up to and including death.**

Most HF is consumed in manufacturing processes or recovered and re-used. HF can make its way into the environment through unintentional releases (spills) and industrial or consumer discharges. HF is not biodegradable, but will readily react with naturally occurring calcium to form inert calcium fluoride.

Manufacture of Product

HF is manufactured by reaction of the mineral fluorospar (calcium fluoride) with sulfuric acid in the presence of heat. The chemical reaction, which produces gaseous hydrogen fluoride and solid calcium sulfate, is outlined below.



The hydrogen fluoride gas is collected, condensed and stored. Hydrofluoric acid is most commonly manufactured by diluting 100% hydrogen fluoride with water.

Product Description

Hydrogen Fluoride is a clear, colorless, fuming liquid or gas with a sharp, pungent odor. Diluted with water, it forms hydrofluoric acid solutions, which are most commonly sold to industry in concentrations of 49% and 70%. Typical physical properties for hydrogen fluoride and hydrofluoric acid solutions are provided in Table 1.

Table 1: Typical physical properties of hydrogen fluoride and hydrofluoric acid

Concentration	49% HF	70% HF	100% HF
Freezing Point	-33°F (-36°C)	-95°F (-71°C)	-118°F (-84°C)
Boiling Point	223°F (106°C)	146°F (63°C)	67.1°F (19.5°C)
Density (68°F)	9.6 lbs/gal	10.1 lbs/gal	8.3 lbs/gal
pH	< 3.4	< 3.0	<1.0 (10% solution)
Flash Point	Not flammable		
Vapor Pressure (68°F)	23 mm Hg	132 mm Hg	771 mm Hg
Vapor Density	2.4 (air = 1.0)		

Product Uses

Hydrogen Fluoride is primarily used to make fluorinated compounds such as refrigerants and other fluorinated organic and inorganic compounds. It is also used by the petroleum refining industry as a catalyst in alkylation processes which boost the octane content of gasoline fuels. Some hydrogen fluoride is diluted with water to make hydrofluoric acid solutions that are used in a wide variety of applications ranging from glass etching to metal surface pickling. A small amount of hydrofluoric acid is used to formulate cleaning and stain removal products occasionally sold to consumers. Consumer products such as rust removers and wheel or brick cleaners may contain hydrofluoric acid in concentrations as high as 5% or more. Consumers of these products should avoid exposure to them since exposure to hydrofluoric acid can cause severe health effects. **Solvay Fluorides, LLC does not sell hydrogen fluoride or hydrofluoric acid directly to consumers and will not knowingly sell to persons that formulate consumer products containing hydrofluoric acid.**

Exposure Potential

- **Workplace exposure** – HF is toxic by ingestion, inhalation or contact with skin and eyes. Exposures can occur at a HF manufacturing facility or at a manufacturing facility that handles HF. Exposure may also occur in the event of a transportation incident. Manufacturing processes or systems where HF is used are usually “closed” (not exposed to the environment) in order to prevent the evolution of HF vapor. Persons involved in maintenance, sampling and testing activities, or in the loading and unloading of HF containers are at greater risk of exposure. Following good industrial hygiene practices will minimize the likelihood of HF exposure; however, persons involved in higher risk activities should always wear proper personal protective equipment such as rubber gloves and boots, an acid suit, goggles and a hard hat. In instances where the potential for splashes is high, a face shield should also be worn. In instances where the likelihood of exposure to HF vapor is present, appropriate respiratory protection should be worn.

Please consult the appropriate [Material Safety Data Sheet](#) for more information on HF exposures and for information concerning exposure limits.

- **Consumer exposure to products containing hydrofluoric acid** – Solvay Fluorides, LLC does not sell HF directly to consumers and will not knowingly sell to persons that formulate consumer products containing HF. However, there are a number of cleaning products (rust removers, wheel cleaners, brick cleaners, etc.) available to consumers that contain HF. Consumers should avoid direct contact with these products and use them in strict compliance with the manufacturer’s instructions. HF is both corrosive and toxic. Exposure to HF can cause severe health effects up to and including death.

- **Environmental releases** - Spills of HF should be contained and isolated from waterways, sewers and drains. Concentrated HF will react violently with water due to the considerable amount of heat evolved during dilution. Small spills of HF should be carefully diluted and then soaked up in an approved absorbent material which can be swept or shoveled up and placed in a suitable container for disposal. The contaminated area should be washed down with water. Lime or calcium hydroxide may be used to neutralize contaminated water and immobilize the fluoride ion as calcium fluoride. Larger spills of HF should be contained and carefully diluted with water before neutralizing with a suitable neutralizing agent. Disposal should be in accordance with applicable local, state or federal regulations. Persons attempting to clean up HF spills should wear proper personal protective equipment, including respiratory protection (See guidelines in the [Material Safety Data Sheet](#)). If required, report spills to the appropriate local, state and federal authorities.
- **Fires** - Fires involving HF should be extinguished using measures appropriate to the circumstances and surrounding environment. Fire fighters should wear self-contained breathing apparatus and protective suits. Containers of HF involved in a fire should be cooled with water sprays to keep the contents cool.

For additional information concerning HF emergency response procedures, please consult the [Material Safety Data Sheet](#).

Health Information

HF is corrosive and toxic by ingestion, inhalation or contact with skin and eyes. Effects can be immediate or may be delayed for as long as 24 hours, so treatment should be given if exposure is suspected. First aid techniques for treatment of HF exposures are unique and exposure to even low levels of HF require a rapid response and the use of calcium (most commonly calcium gluconate solutions or gels) to scavenge and neutralize the fluoride ion. Please consult the [Material Safety Data Sheet](#) for additional information.

Exposures to HF can produce the following adverse health affects:

- **Contact** - Skin exposures can cause symptoms ranging from minor skin irritation to painful redness and swelling. Severe burns can occur if treatment is delayed. Prolonged exposures or exposure to high concentrations may cause pulmonary edema (fluid in the lungs), pneumonitis (inflammation of the lungs), hypocalcemia (low serum calcium), nervous system disorders (tetany) and cardiac arrhythmia (irregular heart beat and/or spasms). Eye exposure to HF may result in severe eye irritation, burns or even blindness.

- **Inhalation** - The inhalation of HF vapor can cause symptoms ranging from nose and throat irritation to coughing and difficulty breathing. Prolonged exposures or exposure to high concentrations may cause pulmonary edema, pneumonitis, hypocalcemia, nervous system disorders and cardiac arrhythmia. Prolonged exposure to low concentrations may cause bone fluorosis and tooth erosion
- **Ingestion** - The ingestion of HF may cause burns to the mouth and throat, nausea, bloody vomiting, abdominal pain, diarrhea, difficulty breathing, loss of consciousness, coma, pneumonitis, hypocalcemia, nervous system disorders and cardiac arrhythmia.
- **Other Effects** - The International Agency for Research on Cancer (IARC) has not determined HF to be carcinogenic (cancer causing) and it has not been found to be mutagenic or to affect reproduction.

For more information on health effects or for information concerning proper first aid measures, please consult the [Material Safety Data Sheet](#).

Environmental Information

Most HF is consumed in the manufacturing process to which it is added. A great deal of HF is also recovered and re-used. Some HF does make its way into the environment through unintentional releases (spills) and industrial or consumer discharges. HF does not bioaccumulate and is not biodegradable. When released to the environment, it readily reacts with naturally occurring calcium to form inert calcium fluoride (CaF).

For more ecological and environmental information concerning this product, please consult the [Material Safety Data Sheet](#).

Physical Hazard Information

HF is extremely corrosive and will corrode many metals and glass. Please consult chemical compatibility tables before selecting vessels, piping, pumps and/or valves for use in HF service.

Exposure of some metals to HF can result in the evolution of flammable hydrogen gas. If allowed to accumulate in a confined space, hydrogen gas can present a fire or explosion hazard.

For more information concerning the physical hazards of this product, please consult the [Material Safety Data Sheet](#).

Regulatory Information

Regulations may exist that govern the manufacture, sale, export, import, storage, transportation, use and/or disposal of this chemical. These regulations can vary by city, state, country or geographic region. Information may be found by consulting the relevant [Material Safety Data Sheet](#) specific to your country or region.

Additional Information

- Solvay America, Inc. (www.solvaynorthamerica.com)
- Solvay Fluorides, LLC. (www.solvaychemicals.us)
- Solvay Fluorides, LLC. Material Safety Data Sheets (www.solvaychemicals.us/EN/Literature/LiteratureDocuments.aspx)
- Contact Solvay Fluorides, LLC. (solvaychemicals.us@solvay.com)
- NJ Department of Health & Senior Services Hazardous Substance Fact Sheets (<http://web.doh.state.nj.us/rtkhsfs/factsheets.aspx>)
- This summary was prepared in January, 2012.

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