

## Product Safety Summary

### Hydrofluoric Acid Solutions

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

- Hydrofluoric acid (HF)
- Hydrofluoric acid solution
- Hydrogen fluoride (aqueous solution)

#### Product Overview

Hydrofluoric acid solutions are used for applications such as glass etching and metal surface pickling. Some hydrofluoric acid is also used to formulate cleaning and stain removal products commonly sold to consumers. **Solvay Fluorides, LLC does not sell hydrofluoric acid solutions directly to consumers and will not knowingly sell to persons that formulate consumer products containing hydrofluoric acid.**

Most hydrofluoric acid solutions are purchased as either 49% or 70% hydrofluoric acid in water and are used in industrial applications and other processes where workplace exposures can occur. Consumer products such as 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. **Hydrofluoric acid is both corrosive and toxic. Exposures require very specific first aid treatment in order to neutralize the fluoride ion. Failure to properly treat a hydrofluoric acid exposure can result in serious health effects up to and including death.**



Most hydrofluoric acid is consumed in manufacturing processes or recovered and re-used. Hydrofluoric acid 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

Hydrofluoric acid is manufactured in several ways. Most of the hydrofluoric acid currently available on the merchant market is manufactured by diluting hydrogen fluoride in water. The process gives off considerable heat and must be done in a heat exchanger so that the product is kept cool. Hydrogen fluoride 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.



Hydrogen fluoride gas is collected, condensed and later diluted with water to make the 49% and 70% hydrofluoric acid solutions typically sold on the merchant market.

## Product Description

Hydrofluoric acid solutions are clear, colorless liquids that have a sharp, pungent odor. Common industrial solution strength concentrations are 49% and 70% in water, but there are a wide range of solutions available. Typical physical properties for hydrofluoric acid solutions are provided in Table 1.

Table 1: Typical physical properties hydrofluoric acid

	49% HF	70% HF
<b>Freezing Point</b>	-33°F (-36°C)	-95°F (-71°C)
<b>Boiling Point</b>	223°F (106°C)	146°F (63°C)
<b>Density (68°F)</b>	9.6 lbs/gal	10.1 lbs/gal
<b>pH</b>	< 3.4	< 3.0
<b>Flash Point</b>	Not flammable	
<b>Vapor Pressure</b>	23 mm Hg	132 mm Hg
<b>Vapor Density</b>	2.4 (air = 1.0)	

## Product Uses

Hydrofluoric acid solutions are used for applications ranging from glass etching and metal surface pickling to the production of other fluoride containing compounds such as fluoroboric acid. Other uses include use by the semiconductor industry for cleaning and etching silicon wafers.

Some hydrofluoric acid is used to formulate cleaning and stain removal products commonly sold to consumers. **Solvay Fluorides, LLC does not sell hydrofluoric acid solutions directly to consumers and will not knowingly sell to persons that formulate consumer products containing hydrofluoric acid.**

## Exposure Potential

- **Workplace exposure** – Hydrofluoric acid is corrosive and toxic by ingestion, inhalation or contact with skin and eyes. Exposures can occur at a hydrofluoric acid (HF) manufacturing facility or a manufacturing, packaging or storage facility that handles HF. Exposure may also occur in the event of a transportation incident. Manufacturing processes or systems where hydrofluoric acid 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 [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 hydrofluoric acid solutions directly to consumers and will not knowingly sell to persons that formulate consumer products containing hydrofluoric acid. However, there are a number of cleaning products (wheel cleaners, brick cleaners, etc.) available to consumers that contain hydrofluoric acid. Consumers should avoid direct contact with these products and use them in strict compliance with the manufacturer's instructions. Hydrofluoric acid is both corrosive and toxic. Exposure to hydrofluoric acid can cause severe health effects up to and including death.

- **Environmental releases** - Spills of hydrofluoric acid should be contained and isolated from waterways, sewers and drains. Small spills of hydrofluoric acid solutions should be diluted, soaked up in an approved absorbent material, swept or shoveled up and placed in suitable containers 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 ions as calcium fluoride. Larger spills of hydrofluoric acid solutions should be contained and diluted with water before neutralizing with a suitable neutralizing agent (lime is preferred). Disposal should be in accordance with applicable local, state or federal regulations. Persons attempting to clean up hydrofluoric acid 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 hydrofluoric acid 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 hydrofluoric acid involved in a fire should be cooled with water sprays to keep the contents cool.

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

## Health Information

**Hydrofluoric acid 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 to hydrofluoric acid 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 hydrofluoric acid 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 hydrofluoric acid may result in severe eye irritation, burns or even blindness.

- **Inhalation** - The inhalation of vapor from hydrofluoric acid solutions 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 (fluid in the lungs), pneumonitis, hypocalcemia, nervous system disorders and cardiac arrhythmia. Prolonged exposure to low concentrations may cause bone fluorosis and tooth erosion
- **Ingestion** - The ingestion of hydrofluoric acid 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 hydrofluoric acid to be carcinogenic (cancer causing) and it has not been found to be mutagenic or 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 hydrofluoric acid is consumed in the manufacturing process to which it is added. A great deal of hydrofluoric acid is also recovered and re-used. Some hydrofluoric acid 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.

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

### Physical Hazard Information

Hydrofluoric acid 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 hydrofluoric acid service.

Exposure of some metals to hydrofluoric acid 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 North America, LLC ([www.solvaynorthamerica.com](http://www.solvaynorthamerica.com))
- Solvay Fluorides, LLC. ([www.solvaychemicals.us](http://www.solvaychemicals.us))
- Solvay Fluorides, LLC. Material Safety Data Sheets ([www.solvaychemicals.us/services/resourcelibrary](http://www.solvaychemicals.us/services/resourcelibrary))
- Contact Solvay Fluorides, LLC. ([www.solvaychemicals.us/feedback](http://www.solvaychemicals.us/feedback))
- NJ Department of Health & Senior Services Hazardous Substance Fact Sheets (<http://web.doh.state.nj.us/rtkhsfs/factsheets.aspx>)
- This summary was prepared in July, 2010

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