

## Product Safety Summary

### Fluorosilicic Acid

CAS No. : 16961-83-4

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

- Fluorosilicic acid (FSA)
- Hexafluorosilicic acid (HFA or HFS)
- Sand acid
- Silicate(2-), hexafluoro- hydrogen (1:2)
- Silicofluoride
- Fluosilicic acid
- Hydrofluorosilicic acid
- Silicofluoric acid
- Silicon hexafluoride dihydride
- Silicate(2-), hexafluoro-, dihydrogen

### Product Overview

Concentrated fluorosilicic acid solution (FSA) is used for water fluoridation, as a metal surface treatment and cleaner and for pH adjustment in industrial textile processing or laundries. It can also be used in the processing of hides, for hardening masonry and ceramics and in the manufacture of other chemicals. FSA can only exist as a liquid. There is no solid form.

Solvay Fluorides, LLC does not sell fluorosilicic acid solutions directly to consumers. Most fluorosilicic acid is used in industrial or municipal applications/processes.

Fluorosilicic acid solutions are corrosive and contact can severely irritate and burn the skin and eyes causing possible permanent eye damage. Breathing concentrated fluorosilicic acid solutions can severely irritate and burn the nose, throat, and lungs, causing nosebleeds, cough, wheezing and shortness of breath. Many of the symptoms described are due to the hydrogen fluoride present as an impurity.

Inhalation or ingestion of large amounts of concentrated fluorosilicic acid solution can cause nausea, vomiting and loss of appetite. Exposure to high concentrations or long term exposures to lower concentrations can cause fluoride poisoning with stomach pain, weakness, convulsions and death. It can also cause deposits of fluorides in bones and teeth, a condition called fluorosis. This may cause pain, disability and discoloration of teeth. ***The above health effects do NOT occur with the low (part per million) levels of fluorosilicic acid solution typically used in water for preventing cavities in teeth (water fluoridation).***

## Manufacture of Product

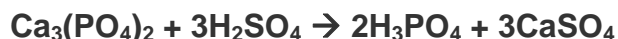
The fluorosilicic acid solution production in North America is estimated to be approximately 235,000 solution tons (470 million pounds of liquid). Solvay Fluorides, LLC supplies fluorosilicic acid obtained through commercial agreements with fertilizer producers. Solvay Fluorides' affiliate, Solvay Fluor Mexico S.A. de C.V., also makes fluorosilicic acid solutions (FSA) at its hydrofluoric acid manufacturing facility located in northern Mexico. Fluorosilicic acid solutions sold by Solvay Fluorides may contain up to 1 percent hydrofluoric acid as a manufacturing impurity.

There are two primary manufacturing processes

- The first manufacturing process utilizes the reaction of hydrogen fluoride (HF) with silicon compounds; either silicon dioxide (SiO<sub>2</sub> - sand) or silicon tetrafluoride (SiF<sub>4</sub>).



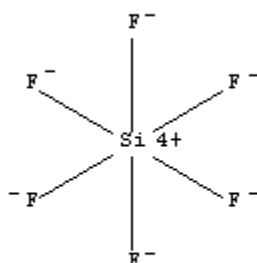
- The second manufacturing process produces fluorosilicic acid solution as a co-product of phosphoric acid manufacturing. Tricalcium phosphate in phosphate rock is converted by the addition of sulfuric acid into phosphoric acid and insoluble calcium sulfate. During the acid addition, fluorine in the phosphate rock (2-4%) and silica, also present as an impurity, form fluorosilicic acid.



### Chemical Structure:

Registry Number: 16961-83-4

Formula:  $F_6Si \cdot 2H$



• 2 H<sup>+</sup>

### Product Description

Fluorosilicic acid ( $H_2SiF_6$ ) is manufactured and sold as aqueous (water) solutions. The solutions are clear, colorless liquids that have a slightly sharp, pungent odor. Common industrial solution strength concentrations are 23-25% and 40% in water. Typical physical properties for fluorosilicic acid solutions are provided in Table 1.

Table 1: Typical physical properties Fluorosilicic acid

	<b>40% FSA</b>	<b>23-25% FSA</b>
<b>Freezing Point</b>	=< -22°F (-30°C)	=< -3°F (-19°C)
<b>Boiling Point</b>	227.3°F (108.5°C)	221°F (105°C)
<b>Relative Density</b>	1.32 @ 68°F (20°C)	1.23 @ 60°F (15.6°C)
<b>pH</b>	≈1 (100 g /l)	≈1 (100 g /l)
<b>Flash Point</b>	Non- flammable	Non- flammable
<b>Vapor Pressure</b>	22.5 mmHg (30 hPA) @ 68°F (20°C)	22.5 mmHg (30 hPA) @ 68°F (20°C)
<b>Decomposition temperature</b>	226°F (108 °C)	221°F (105 °C)

## Product Uses

Fluorosilicic acid solution (FSA) is used for water fluoridation, as a metal surface treatment and cleaner and pH adjustment in industrial textile processing or laundries. It can also be used in the processing of hides, for hardening masonry and ceramics and in the manufacture of other chemicals. Solvay Fluorides' FSA is certified by NSF International (a water chemicals certification agency).

## Exposure Potential

- **Workplace exposure** - Exposure can occur at either a fluorosilicic acid manufacturing facility, or a manufacturing, packaging or storage facility that handles fluorosilicic acid solutions. Exposure may also occur in the event of a transportation incident. Manufacturing processes or systems in which FSA is used may be 'open' (exposed to the environment) or 'closed' (not exposed to the environment) depending on the equipment or application. Persons involved in maintenance, sampling and testing activities, or in the loading and unloading of fluorosilicic acid containers are at greater risk of exposure. Following good industrial hygiene practices will minimize the likelihood of exposure; however, persons involved in higher risk activities should always wear proper personal protective equipment such as rubber gloves and boots, an acid or slicker suit, respiratory protection, goggles and hard hat. In instances where the potential for splashes is high, a face shield should also be worn.

Please consult the [Material Safety Data Sheet](#) for information concerning exposure limits.

- **Consumer exposure to products containing Fluorosilicic acid** - Most consumers will encounter fluorosilicic acid at very, very low levels in their fluoridated drinking water. Solvay Fluorides does not sell fluorosilicic acid solutions directly to consumers. Users should follow the manufacturer's use and/or label instructions if fluorosilicic acid is listed as a component.
- **Environmental releases** - Spills of fluorosilicic acid should be contained and isolated from waterways and sewers or drains. Small spills of fluorosilicic acid solutions should be soaked up in an approved absorbent material, which can be swept or shoveled up and placed in suitable containers for disposal. The contaminated area should be washed down with plenty of water. Lime or calcium hydroxide may be used to neutralize contaminated water and immobilize the fluoride ions as calcium fluoride. Spills of fluorosilicic acid solutions should be diluted with large amounts of water. Disposal should be in accordance with applicable local, state or federal regulations. Persons attempting



to clean up fluorosilicic acid solution spills should wear proper personal protective equipment (See guidelines in the Workplace exposure section of this document or the [Material Safety Data Sheet](#)). If required, report spills to the appropriate state or federal authorities.

- **Fires** - Fires involving fluorosilicic acid should be extinguished using measures appropriate to the circumstances and surrounding environment. Hazardous decomposition products such as hydrogen fluoride vapor can be generated if FSA is involved in a fire. Fire fighters should wear self-contained breathing apparatus and protective suits.

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

### Health Information

Most commercial fluorosilicic acid solutions contains hydrofluoric acid as an impurity. Solvay Fluorides' fluorosilicic acid solutions contain less than 1% hydrofluoric acid. First aid techniques for treatment to hydrofluoric acid exposures are unique. Even low levels of exposure to HF require a rapid response and the use of calcium (most commonly calcium gluconate solutions or gels) to scavenge and neutralize the fluoride ion. Effects may be delayed, so treatment should be given even if exposure is suspected. Please consult the [Material Safety Data Sheet](#) for additional information.

Exposures to industrial strength fluorosilicic acid can produce the following adverse health affects mainly due to the hydrofluoric acid impurity present:

- **Contact** - Skin exposures can cause symptoms ranging from minor skin irritation to painful redness and swelling. Severe burns can occur if treatment is delayed after exposure to fluorosilicic acid. Eye exposure to fluorosilicic acid may result in severe eye irritation, burns or even blindness.
- **Inhalation** - The inhalation of vapor from fluorosilicic acid solutions can cause symptoms ranging from nose and throat irritation to coughing and difficulty breathing. Aspiration may cause pulmonary edema and pneumonitis (fluid on the lungs and inflammation of the lungs). Repeated or prolonged exposures may cause sore throat, nosebleeds and chronic bronchitis. Prolonged exposure may cause hypocalcemia, nervous system disorders (tetany) and cardiac arrhythmia (reduced calcium levels, spasms and irregular heart beat).

- **Ingestion** - The ingestion of fluorosilicic acid may cause burns of the mouth and throat. Nausea, bloody vomiting, abdominal pain, diarrhea, difficulty breathing, swelling of the throat, loss of consciousness, coma and heart failure can also occur.
- **Other Effects** - The International Agency for Research on Cancer (IARC) has not determined fluorosilicic acid to be carcinogenic (cancer causing). FSA has not been found to be mutagenic or affect reproduction.

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

### **Environmental Information**

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

### **Physical Hazard Information**

Fluorosilicic acid is corrosive and can corrode many metals. It is not flammable or explosive.

Exposure of fluorosilicic acid to metals, strong oxidizers or high temperatures can cause decomposition. Decomposition of fluorosilicic acid will result in the liberation of hydrogen fluoride and hydrogen gas.

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](http://www.solvaynorthamerica.com)
- Solvay Fluorides, LLC. [www.solvaychemicals.us](http://www.solvaychemicals.us)
- Solvay Fluorides, LLC. Material Safety Data Sheets  
[www.solvaychemicals.us/EN/Literature/LiteratureDocuments.aspx](http://www.solvaychemicals.us/EN/Literature/LiteratureDocuments.aspx)
- Contact Solvay Fluorides, LLC. [solvaychemicals.us@solvay.com](mailto: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 March, 2010.

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