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Fluorosilicic Acid Product Data Sheet

Revision Date: 3/5/13

Description

Penco's Fluorosilicic Acid (FSA), also known as Hydrofluosilicic acid (HFS), is a water-white to a straw-yellow colored solution with the chemical formula H_2SiF_6 . Fluorosilicic Acid is manufactured from the mineral apatite, which is mined for its high phosphate content. The phosphate is used widely in the fertilizer industry and the fluoride recovered from the apatite is used to produce Fluorosilicic Acid. FSA produced in this way is very pure and cost effective.

Application

Fluorosilicic Acid is the chief additive used for water fluoridation in the United States. The Center for Disease Control lists the fluoridation of water as one of the ten great public health achievements of the 20th century.

Typical Analysis

Concentration (% H_2SiF_6).....	23%
Density (lbs/gal).....	10.2
Specific Gravity.....	1.2
Free Acid.....	<1.0%
pH.....	1.2
Appearance.....	water-white to straw yellow
Odor.....	pungent
Freezing Point.....	4°F

Health and Safety

Fluorosilicic Acid can cause burns to the skin and eyes. Ensure that individuals handling Fluorosilicic Acid have been fully trained regarding the MSDS, along with PPE requirements and specific operational procedures. For a MSDS, call 979-885-0005 or 800-864-1742. In the event of an emergency, call 24 hr. CHEMTREC: 800-424-9300.

Certifications

Fluorosilicic Acid is ANSI/NSF Standard 60 certified for use in potable water treatment and also meets or exceeds all AWWA standards.

Product Handling and Shipping

Fluorosilicic Acid is shipped in railcars and tank trucks. Suitable materials of construction include PVC, polypropylene, polyethylene, and Teflon. It is not compatible with metals and most fiberglass resins. It can be used with diaphragm metering pumps, providing the materials of construction are compatible. No dilution or preparation necessary.

DOT Classification: Fluorosilicic Acid

Hazard Class: 8

DOT ID Number: UN 1778

Packing Group: II

Penco provides the information contained in each material safety data sheet ("MSDS"), technical data sheet ("TDS"), product information brochure and/or information contained herein (including data and statements) in good faith and makes no representations as to its comprehensiveness or accuracy as of the date of publication. The MSDSs, TDSs, and product information brochures are referred to collectively as the "Data Sheets". It is the responsibility of the user to obtain and use the most recent version of the Data Sheets. Each Data Sheet relates only to the specific product designated therein and may not be valid where such product is used in combination with any other materials or in any process. Further, since the conditions and methods of use of the product and information are beyond the control of Penco, Penco expressly disclaims any and all liability as to any consequential damages or results obtained or arising from any use of the products or the information contained in the Data Sheets. NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE AS CONCERNS THE DATA SHEETS OR THE RELATED PRODUCTS.



INDUSTRIAL PRODUCTS

Product Name: **Hydrofluosilicic Acid (HFSA)**

23% H₂SiF₆

Grade: **Industrial**

Order Code: **HFSA**

MSDS No.: **52**

Source: Aurora

Alternate Names: Fluosilicic Acid, FSA

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TYPICAL ANALYSIS	TYPICAL	GUARANTEE
HFSA, as H ₂ SiF ₆	24.1	23.0 min.
H ₂ SiF ₆ , as F	19.1	
Heavy Metals, as lead (Pb)	<0.02%	
Phosphates, as P ₂ O ₅	0.2	
Lead, as Pb	1.0 ppm	
Iron, as Fe ₂ O ₃	70 ppm	
Iodide, as I	16 ppm	
Arsenic, as As	6.0 ppm	

PHYSICAL DATA	TYPICAL	GUARANTEE
Appearance	Water White to Straw Yellow, Pungent Odor	
Specific Gravity @ 75°F	1.23	
Weight, lbs/gal @ 75°F	10.3	

QUALITY*		
Maximum Dosage	6 mg/L	

* This product is NSF Certified to ANSI Standard 60 for the fluoridation of municipal water supplies.





PO Box 600 San Felipe, Texas 77473
(979) 685-0005 Fax: (979) 885-3208

AFFIDAVIT OF COMPLIANCE

This is to certify that the Hydrofluorosilicic Acid supplied by our company meets AWWA Standard B703-11 (as amended in B703a-13) or latest revision, and is certified to NSF/ANSI Standard NSF-60.



Signature

R. L. Horne, President

Name and Title of Official

5/1/2017

Date



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Technical Bulletin: How Fluoride Works

Fluoride and Teeth

Dental caries, or cavities, are caused by dissolution of tooth enamel. Primarily, this occurs when oral bacteria and enzymes underneath plaque metabolize sugars and carbohydrates into acids that slowly decay the tooth.¹

Specifically, when enough organic acid has been produced to decrease the pH below 5.5, the acid dissolves hydroxyapatite ($\text{Ca}_{10}(\text{PO}_4)_6\text{OH}_2$), the fundamental component of tooth enamel. This process of demineralization can be reversed by mineral recovery from ions in saliva during the absence of sugars – a process called remineralization. Tooth decay happens when the rate of demineralization is greater than that of mineralization.²

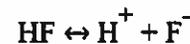
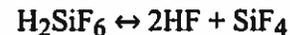
Fluoride ions (F^-) introduced to the mouth at low-levels, whether through fluoridated drinking water or other fluoride products, mix with the dissolved hydroxyapatite in the plaque fluid. The resultant minerals are hydroxyfluorapatite or fluorapatite, depending on substitution of one or two hydroxyl groups with fluoride, respectively. Both of these are less soluble in acid than hydroxyapatite and, consequently, provide greater resistance to tooth decay as they become incorporated into the enamel.²

Furthermore, fluoride is known to increase the rate of mineralization from higher concentrations of calcium phosphate salts. Also, fluoride inhibits the substrates of oral bacteria, reducing the amount of acid produced and slowing the rate of demineralization.²

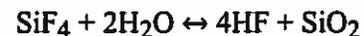
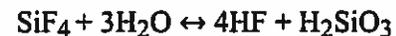
Water fluoridation is accordingly used in the majority of U.S. cities to prevent this chronic disease.

Fluorosilicic Acid Mechanism

Hydrofluorosilicic acid (H_2SiF_6) is a product of the phosphate industry. Fluorosilicic acid does not exist as a discrete species, but rather refers to an equilibrium mixture with hexafluorosilicate anion (SiF_6^{2-}) in aqueous, protic solutions. Consequently, fluorosilicic acid completely dissociates in solution into hydrofluoric acid and silicon tetrafluoride. Hydrofluoric acid then quickly dissociates to a proton and fluoride ion.



The silicon tetrafluoride reacts with water to form silicic acid and silicon dioxide.



These four moles of hydrofluoric acid will then dissociate as before, yielding complete ionization of fluorine. Accordingly, fluorosilicic acid is very effective in fluoridating water.¹

References

¹American Water Works Association. AWWA Manual M4, *Water Fluoridation Principles and Practices*. (5th ed.). 2004. Denver, CO. American Water Works Association.

²Featherstone, JD. Dental caries: a dynamic disease process. 2008. *Aust Dent J*. Sep;53(3):286-91.