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DATA SHEET

Fluorosilicic Acid Information Pack

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Fluorosilicic Acid for Fluoridation of Potable Water

Introduction

Yara Industrial is the main supplier in the UK of fluorosilicic acid for fluoridation of potable water and this Product Guidance Note contains our understanding of the major issues relating to the production and supply of this product.

The Policy of Yara

Yara is willing to be the supplier of fluorosilicic acid for fluoridation of potable water but the company has no declared position on the promotion or otherwise of fluoridation. All product is supplied in accordance with the requirements of British Standard, BS EN 12175:2006 Chemicals used for treatment of water intended for human consumption, Hexafluorosilicic acid.

Fluorosilicic Acid

There are two processes used to manufacture Fluorosilicic Acid:

1. It is a co-product manufactured alongside phosphoric acid. Phosphate rock, Apatite, is dissolved in sulphuric acid and the evolved silicon tetrafluoride gas is dissolved in water to form the product, fluorosilicic acid. Fluoride is a natural major impurity of a phosphate ore, as CaF_2 , and it reacts with sulphuric acid so that fluoride is dissolved in the acid produced (weak acid). When heated and concentrated phosphoric acid "liberates" the fluoride ions, and this fluoride is collected by gas-washing units, in order to prevent from gaseous emission into the atmosphere and to produce hexafluorosilicic acid.
2. Reaction between hydrofluoric acid and silica. Hydrofluoric acid (HF) is produced when dry fluor spar is reacted with sulphuric acid. This reaction takes place in a rotary kiln, with indirect heating. The HF comes out of the kiln as a gas. The HF gas is washed, cooled, condensed and stored. It is then reacted with silica.

The chemical name for the product is Hexafluorosilicic Acid.

Source

Yara imports Fluorosilicic acid from Europe.

Application

Yara Industrial's 20% strength Fluorosilicic acid is used in the UK by the water service companies for fluoridation of potable water.

Fluoridation is the term used to describe the addition of a fluoride chemical to water supplies to raise the fluoride level to 1 milligram per litre (1 mg/l = 1 part per million), to prevent tooth decay. The maximum fluoride concentration permitted in drinking water under the Water Supply (Water Quality) Regulations is 1.5 mg/l.

For a water supply with no naturally occurring fluoride, this requires the addition of 5.36 parts of 20% fluorosilicic acid to 1 million parts of water on a volume basis - a volumetric dilution of 186,500 times.

Water fluoridation is governed by the Water Industry Act 1991 and amended by the Water Act 2003. The act gives Strategic Health Authorities (SHAs) the responsibility of deciding the need for fluoridation. Before any new fluoridation scheme can be put in place the SHA must complete a local consultation process and provide the water company with an indemnity against costs.

The Department of Health is responsible for national policy on fluoridation, more information can be found on their website www.dh.gov.uk.

The Drinking Water Inspectorate checks that water companies comply with all drinking water regulations.

When a water company adds fluoride to water supplies, it must comply with the Code of Practice on the Technical Aspects of Fluoridation of Water Supplies 2005 (Issued by Drinking Water Inspectorate, February 2005).

Purity Criteria

BS EN 12175:2006 Section 4 provides information on the purity requirements of Fluorosilicic acid.

Limits have been given for impurities and chemicals parameters where these are likely to be present based on the production process and raw materials.

Specification

20% Fluorosilicic acid supplied by Yara complies fully with specification requirements: BS EN 12175:2006, Section 4.3 Impurities, main by-products Table 1 - Impurities and Section 4.4 Chemical Parameters Table 2 - Chemical Parameters.

Yara Industrial monitor the level of each element which will be added to drinking water as a result of dosing fluorosilicic acid to achieve the Water Act 2003 recommended fluoride concentration of 1 mg/litre.

Table 1: Summary of key impurities and parameters as specified in BS EN 12175

| Constituent | Limits in mass fraction in % of commercial product | Expressed as |
|---|--|--|
| Composition | 20 - 40 (\pm 5%) | % m/m H ₂ SiF ₆ |
| Free hydrogen fluoride as HF (not H ₂ SiF ₆) | 1.5 max | % m/m HF |
| Phosphate | 0.75 max | % m/m as P ₂ O ₅ |
| Parameter | Limit | Expressed as |
| Antimony (Sb) max | 80 | mg/kg H ₂ SiF ₆ (100%) |
| Arsenic (As) max | 400 | mg/kg H ₂ SiF ₆ (100%) |
| Cadmium (Cd) max | 40 | mg/kg H ₂ SiF ₆ (100%) |
| Chromium (Cr) max | 400 | mg/kg H ₂ SiF ₆ (100%) |
| Lead (Pb) max | 400 | mg/kg H ₂ SiF ₆ (100%) |
| Mercury (Hg) max | 10 | mg/kg H ₂ SiF ₆ (100%) |
| Nickel (Ni) max | 400 | mg/kg H ₂ SiF ₆ (100%) |
| Selenium (Se) max | 80 | mg/kg H ₂ SiF ₆ (100%) |

Quality Control

The product is tested on receipt into UK to ensure it is of an acceptable quality, then transferred into dedicated storage tanks. It is then further tested before despatch to ensure that it conforms with the above specification. The Yara Integrated Management System has been approved to BS EN ISO 9001:2008, BS EN ISO 14001:2004 and OHSAS 18001:2007 by Det Norske Veritas, DNV.

Every delivery to customers, whether by dedicated tanker or IBC's, is accompanied by a Certificate of Conformity to the agreed specification.

Health and Safety

Yara Industrial provides a Safety Data Sheet for Hexafluorosilicic Acid to all customers purchasing this product in line with regulations. i.e. REACH.

In addition Yara Industrial conducts:

- Site Safety Audits for all new dosing installations to ensure safe deliveries can be made
- Operator training where requested

