Occidental Chemical Corporation
A subsidiary of Occidental Petroleum Corporation

Product Stewardship Summary
Liquid Sodium Silicates

Summary

Sodium silicates serve a wide range of end use markets, including soaps and detergents, pulp and paper, paint and pigments, catalysts, and metal cleaning.

1. Chemical Identity

Name: Sodium Silicate
Chemical Abstracts Service (CAS) number: 1344-09-8

Sodium silicate is the generic name for a series of compounds derived from soluble sodium silicate glasses. These materials are aqueous liquids containing sodium oxide (Na_2O) and silicon dioxide (SiO_2) in various ratios. Varying the amount of SiO_2 and Na_2O gives solutions having differing properties and diverse industrial applications.

2. Production

Sodium silicate glass is made by fusing high purity silica sand and soda ash in open hearth furnaces at 1300°C. The molten glass is cooled, fractured, and dissolved under pressure with hot water and steam. OxyChem is a leading manufacturer of sodium silicates and operates facilities in Augusta, GA; Chicago, IL; Cincinnati, OH; Dallas, TX; and Mobile, AL.

3. Uses

Sodium Silicates are used in a wide variety of applications. Some of the principle uses are summarized in this section.

Detergents & Soaps
Many detergent operations are performed with sodium silicates. Such operations range from metal cleaning and textile processing to washing laundry, dishes, dairy equipment, bottles, floors, and automobiles.

Silicates are incorporated in synthetic detergent compositions to control corrosion and minimize alkali attack. Without silicates, many synthetic detergent compositions would be corrosive to aluminum, zinc, and certain metal alloy parts in washers. They may also attack porcelain enamel and overglaze fine china decorations.

Adhesives and Cements
Liquid sodium silicates are widely used as adhesives in making fiber drums, paper tubes, and other materials. Sodium silicate is an excellent adhesive for sealing fiberboard boxes because it sets quickly and firmly holds the flaps together. Advantages of a soluble silicate adhesive include the easy wetting of

the surfaces to be joined, controlled penetration, suitable viscosity, good setting characteristics, and high strength. Sodium silicates are especially valuable as adhesives because they can change from a liquid to a semi-solid condition upon the loss of a small amount of water.

Sodium silicates are used in making many kinds of cement, including cements for acid-proof construction, refractories, and thermal insulating materials. Advantages of sodium silicates as binders in cements include resistance to acid, high temperature, and water.

Pulp & Paper

Sodium silicates are used for de-inking, sizing, coating, and bleaching of recycled paper products in the pulp and paper industry.

Gels and Powders

Sodium silicate is a key feedstock for the manufacture of silica gels. These products are granular, glassy materials that have a large capacity to absorb moisture and other substances. Gels are useful as dehumidifying agents for air and other gases, and as filtering agents to clarify juices and beers.

Silica powders serve as additives for rubber products to provide abrasion and wear resistance. They are also used as thickening agents in inks, plastics and varnishes, suspending agents in paints, and anti-caking additives in various compounds.

Sodium silicates are raw materials for molecular sieves. These compounds are crystalline in structure and have controlled internal pore sizes, giving them the ability to separate mixtures of different sized molecules.

Petroleum Industry

Sodium silicates are used in making silica-alumina catalysts for various operations in the petroleum industry, such as the production of high octane gasoline.

Foundry

Mixtures of sand and silicate offer advantages in making molds and cores in foundries by eliminating the need for drying or baking, as required with oil or resin bonded forms.

Soil Stabilization

Soil stabilization techniques take advantage of the gel-forming property of sodium silicate to increase load-bearing capacity, arrest settlement and lateral movement of foundations, and control the flow of water in earthwork engineering projects such as dams, mines, tunnels, and excavations.

Water Treatment

Activated silica colloidal solutions act as coagulants in applications for treating both raw and waste waters.

Corrosion of iron in water systems may be controlled by the addition of small amounts of sodium silicate, which deposits a thin protective film of silica on the metal.

Coatings

Sodium silicate solutions are used in making various paints and coatings, as well as for welding rods and roofing granules.

4. Physical and Chemical Properties

Sodium silicates are colorless liquids that feel slippery to the touch. These products do not have a distinguishing odor. Sodium silicates are stable at normal temperatures and pressures and are not combustible. Spills of sodium silicate can be very slippery. Spilled material dries to form a glass film that can cut skin.

5. Health Effects

Sodium silicate solutions are alkaline solutions, meaning they have high pH. The pH typically ranges from 11.2 to 12.7. This property makes sodium silicate solutions irritating to the skin, mucous membranes and eyes.

Contact with the eyes can cause severe irritation, pain, and corneal burns possibly leading to blindness. Direct contact with the skin may cause irritation. Inhaling mists of sodium silicates may result in irritation of the respiratory tract with symptoms such as coughing, choking and pain. Ingesting sodium silicate is unlikely; however, if ingested, it is moderately toxic and may cause pain and burns of the esophagus and gastrointestinal tract with vomiting, nausea, and diarrhea.

There are no known chronic hazards associated with sodium silicates. They are not classified as carcinogens by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the Occupational Safety and Health Administration (OSHA). Sodium silicate liquid (or dried residue) should not be confused with crystalline silica. Sodium silicate is not in a molecular structure that can cause silicosis. Sodium silicate is water soluble and will dissolve over time, but sodium silicate will not.

6. Environmental Effects

If released to land, only water will evaporate from the material.

If released to water, sodium silicate will initially sink, then mix with water. Because sodium silicates have a high pH, they can be acutely toxic. Sodium silicates have exhibited moderate toxicity to aquatic organisms and slight toxicity to terrestrial organisms. The diluted material will decompose to become silica that is no different that natural dissolved silica. Silica does not bioconcentrate up the food chain.

7. Exposure

Most sodium silicates are irritants, however certain grades can be corrosive to the skin and eyes. The most likely manners in which exposures can occur are:

- Worker exposure – Exposure could occur in the manufacturing facility or in industrial facilities that use sodium silicates. When exposures occur, they are typically skin or eye exposures. Good industrial hygiene practices and the use of personal protective equipment will minimize the risk of exposure.
- Consumer exposure – OxyChem does not sell sodium silicate in retail stores, although it may be an ingredient in some consumer products.
- Releases – If a spill occurs, emergency response personnel should wear protective equipment to minimize exposures.

8. Recommended Risk Management Measures

Sodium silicates are non-flammable, non-explosive, and non-toxic. They are, however, alkaline materials and pose hazards to the skin and eyes. The physiological effects of contact vary with the alkalinity of the silicate involved, and range from causing irritation to causing chemical burns.

While the liquid grades of sodium silicate of greater than 1.6 weight ratio are not strongly alkaline, they should be handled with care. If there is any risk of liquid silicate splashing in the eyes, goggles should be worn. It is also recommended that appropriate protective clothing and gloves be worn to prevent silicate from coming into contact with the skin. Under no circumstances should liquid sodium silicates be taken internally.

Prior to using any liquid silicate, carefully read and comprehend the Material Safety Data Sheet for the grade of silicate being used.

9. Product Stewardship Programs

A product handbook prepared by OxyChem is available for this group of products. The handbook includes technical data regarding the products as well as more detailed information about the manufacturing process and product uses. In addition, specific information for unloading tank cars, tank trucks, and handling drums of material is provided. Other topics include recommendations on storage and equipment.

10. Regulatory Compliance Information

The following is a summary of regulations that may pertain to sodium silicates (additional regulations and guidelines may apply):

- Most liquid sodium silicates are not regulated as hazardous materials by the DOT. Grade 58 is the only OxyChem liquid sodium silicate product that is DOT regulated.
- OSHA has not established an occupational exposure limit for sodium silicates.
- EPA has not established Acute Exposure Guideline Limits (AEGLs) for these compounds.
- Sodium silicates have Generally Recognized as Safe (GRAS) status under specific FDA regulations.

11. Sources for Additional Information

- OxyChem Product Handbook web site:
  http://www.oxy.com/OurBusinesses/Chemicals/Products/Pages/AlkaliProducts.aspx#alk_silicates
- Material Safety Data Sheet web site:
  http://www.oxy.com/OurBusinesses/Chemicals/Products/Pages/MSDSSearch.aspx
- Hazardous Substances Data Bank (HSDB), Toxicology Data Network, United States National Library of Medicine, HSDB Number: 5028

12. Contact Information: For additional information, call 1-800-752-5151 or 1-972-404-3700.

13. Preparation Date: 12/12/2008 **Revised**: 02/13/2013

This Product Stewardship Summary is intended to give general information about the product discussed above. It is not intended to provide an in-depth discussion of all health and safety information about the product or to replace any required regulatory communications.