Siliconexample essay

I. IntroductionSilicon is a metalloid at room temperature with an atomic number of 14, 14 electrons, 14 neutrons, and an average atomic mass of 28. 0855. In its pure form silicon melts at 2, 570 degrees, and boils at 4, 271 degrees Fahrenheit. This element belongs to the metalloid family, the 14th family on the periodic table of elements.

This element is a solid metalloid at room temperature and turns to liquid at 2, 570 degrees. Silicon is prepared as a brown amorphous powder or as gray-black crystals. Crystalline silicon has a metallic luster and grayish color. It is hard, non-magnetic, and most acids do not effect it, but it does dissolve in hydrofluoric acid, forming the gas, silicon tetrafluoride, SiF 4.

At ordinary temperatures silicon is impervious to air, but at high temperatures it reacts with oxygen, forming a layer of silica that does not react further. At high temperatures it also reacts with nitrogen and chlorine to form silicon nitride and silicon chloride, respectively. Elemental silicon transmits more than 95% of all wavelengths of infrared, from 1. 3 to 6.

y micro-m. II. DiscoveryThough silicon was originally discovered in 1810 and thought to be a compound silicon was discovered as an element in 1823 by Jons Berzelius. In 1824 Berzelius prepared amorphous silicon by the same general method and purified the product by removing the fluosilicates by repeated washings.

Deville in 1854 first prepared crystalline silicon, the second allotropic form of the element. Davy in1800 thought silica to be a compound and not an element; later in 1811, Gay Lussac and Thenard probably prepared impure amorphous silicon by heating potassium with silicon tetrafluoride. III. General

InformationSilicon is present in the soil and makes up about 25. 7% of the earths crust.

Silicon also promotes firmness and strength in human tissues. It is part of the arteries, tendons, skin, connective tissue, and eyes. This mineral is also present with the chondroitin sulfates of cartilage, and it works with calcium to help restore bones. Silicon is also thought to radiate or transmit energy in its crystalline structure, as in quartz crystal. It is thought by some to be able to deeply penetrate the tissues and help to clear stored toxins. Research shows silicon is important to plant and animal life.

Results of studies on animals suggest that silicon may be essential to humans. This mineral is able to form long molecules, much the same as is carbon, and gives these complex configurations some durability and strength. It represents about 0. 05 percent of our body weight. IV. ImportanceSilicon is present in the sun and stars and is the second most abundant element, being exceeded only by oxygen.

Silicon is not found free in nature, but occurs chiefly as the oxide and as silicates. Sand, quartz, rock crystal, amethyst, agate, flint, jasper, and opal are some of the forms in which the oxide appears. Granite, hornblende, asbestos, feldspar, clay, mica, etc. are but a few of the numerous silicate minerals. Silicon is prepared commercially by heating silica and carbon in an electric furnace, using carbon electrodes. Several other methods can be used for preparing the element.

Amorphous silicon can be prepared as a brown powder, which can be easily melted or vaporized. The Czochralski process is commonly used to produce

single crystals of silicon used for solid-state or semiconductor devices. Hyperpure silicon can be prepared by the thermal decomposition of ultra-pure trichlorosilane in a hydrogen atmosphere, and by a vacuum float zone process. Silicon is one of man’s most useful elements.

In the form of sand and clay it is used to make concrete and brick; it is a useful refractory material for high-temperature work, and in the form of silicates it is used in making enamels, pottery, etc. Silica, as sand, is a principal ingredient of glass, one of the most inexpensive of materials with excellent mechanical, optical, thermal, and electrical properties. Hyperpure silicon can be doped with boron, gallium, phosphorus, or arsenic to produce silicon for use in transistors, solar cells, rectifiers, and other solid-state devices which are used extensively in the electronics and space-age industries. V.

UsesSodium silicate, Na2SiO3, an important synthetic silicate, is a colorless, water-soluble, amorphous solid that melts at 1088 C (1990 F). It is prepared by reacting silica (sand) and sodium carbonate at a high temperature or by heating sand with concentrated sodium hydroxide under pressure. The aqueous solution of sodium silicate, called water glass, is used for preserving eggs; as a substitute for glue in making boxes and other containers; as a binder in artificial gemstones; as a fireproofing agent; and as a binder and filler in soaps and cleansers. Another important silicon compound is the silicon-carbon compound Carborundum, which is used as an abrasive.

Hydrogenated amorphous silicon has shown promise in producing economical cells for converting solar energy into electricity. Glass from

silicon can be made in a very great variety of shapes, and is used as containers, window glass, insulators, and thousands of other uses. They may be prepared by hydrolyzing a silicon organic chloride, such as dimethyl silicon chloride. Hydrolysis and condensation of various substituted chlorosilanes can be used to produce a very great number of polymeric products, or silicones, ranging from liquids to hard, glasslike solids with many useful properties.

Silicon is a semiconductor, in which the resistivity to the flow of electricity at room temperature is in the range between that of metals and that of insulators. The conductivity of silicon can be controlled by adding small amounts of impurities, called dopants.

The ability to control the electrical properties of silicon, and its abundance in nature, have made possible the development and widespread application of transistors and integrated circuits used in the electronics industry. Silicon is used in the steel industry as a constituent of silicon-steel alloys.

In steel making, molten steel is deoxidized by the addition of small amounts of silicon; ordinary steel contains less than 0. 03 percent of silicon. Silicon steel, which contains from 2. 5 to 4 percent silicon, is used in making the cores of electrical transformers because the alloy exhibits low hysteresis (seeMagnetism). A steel alloy, known as duriron, containing about 15 percent silicon, is hard, brittle, and resistant to corrosion; duriron is used in industrial equipment that comes in contact with corrosive chemicals.

Silicon is also used as an alloy in copper, brass, and bronze. Silicon is often used in herbal remedies to promote strength in the hair, skin, and nails. It

helps maintain the elasticity of the skin, so it may be one of our antiaging nutrients. Other possible uses of silica or silicon that are under investigation are to reduce the risk of atherosclerosis and heart disease, to treat arthritis and other joint or cartilage problems, gastric ulcers, and other conditions where tissue repair and healing are needed.

Silicon is thought to help heal fractures and may have some role in the prevention or treatment of osteoporosis.