Strontium - Sr

Chemical properties of strontium - Health effects of strontium - Environmental effects of strontium

Atomic number	38
Atomic mass	87.62 g.mol $^{-1}$
Electronegativity according to Pauling	1.0
Density	2.6 g.cm^{-3} at 20°C
Melting point	769 °C
Boiling point	1384 °C
Vanderwaals radius	0.215 nm
Ionic radius	0.113 nm (+2)
Isotopes	14
Electronic shell	[Kr] 5s^2
Energy of first ionisation	549.2 kJ.mol $^{-1}$
Energy of second ionisation	1064 kJ.mol $^{-1}$
Discovered by	A. Crawford in 1790

Strontium

Strontium is a soft, silver-yellow, alkaline-earth metal. It has three allotropic crystalline forms and in its physical and chemical properties it is similar to calcium and barium. Strontium reacts vigorously with water and quickly tarnishes in air, so it must be stored out of contact with air and water. Due to its extreme reactivity to air, this element always naturally occurs combined with other elements and compounds. Finely powdered strontium metal will ignite spontaneously in air to produce both strontium oxide and strontium nitride.

Applications

Strontium has uses similar to those of calcium and barium, but it is rarely employed because of its higher cost. Principal uses of strontium compounds are in pyrotechnics, for the brilliant reds in fireworks and warning flares and in greases. A little is used as a getter in vacuum tubes to remove the last traces of air. Most strontium is used as the carbonate in special glass for television screens and visual display units. Although strontium-90 is a dangerously radioactive isotope, it is a useful by-product of nuclear reactors from whose spent fuel is extracted. Its high-energy radiation can be used to generate an electric current, and for this reason it can be used in space vehicles, remote weather stations and navigation buoys.

Strontium in the environment

Strontium is commonly occurs in nature, formung about 0.034% of all igneous rock and in the form of the sulfate mineral celestite ($SrSO_4$) and the carbonate strontianite ($SrCO_3$). Celestite occurs frequently in sedimentary deposits of sufficient size, thus the development of mining facilities attractive. The main mining areas are UK, Mexico, Turkey and Spain. World production of strontium ores is about 140.000 tonnes per year from an unassessed total of reserves.

Foods containing strontium range from very low e.g. in corn (0.4 ppm and oranged (0.5 ppm) to high, e.g. in cabbage (45 ppm), onions (50 ppm) and lattuce (74 ppm).

Health effects of strontium

Strontium compounds that are water-insoluble can become water-soluble, as a result of chemical reactions. The water-soluble compounds are a greater threat to human health than the water-insoluble ones. Therefore, water-soluble forms of strontium have the opportunity to pollute drinking water. Fortunately the concentrations in drinking water are usually quite low.

People can be exposed to small levels of (radioactive) strontium by breathing air or dust, eating food, drinking water, or by contact with soil that contains strontium. We are most likely to come in contact with strontium by eating or drinking.
Strontium concentrations in food contribute to the strontium concentrations in the human body. Foodstuffs that contain significantly high concentrations of strontium are grains, leafy vegetables and dairy products.

For most people, strontium uptake will be moderate. The only strontium compound that is considered a danger to human health, even in small quantities, is strontium chromate. The toxic chromium that it contains mainly causes this. Strontium chromate is known to cause lung cancer, but the risks of exposure have been greatly reduced by safety procedures in companies, so that it is no longer an important health risk.

The uptake of high strontium concentrations is generally not known to be a great danger to human health. In one case someone experienced an allergic reaction to strontium, but there have been no similar cases since. For children exceeded strontium uptake may be a health risk, because it can cause problems with bone growth.
Strontium salts are not known to cause skin rashes or other skin problems of any kind.
When strontium uptake is extremely high, it can cause disruption of bone development. But this effect can only occur when strontium uptake is in the thousands of ppm range. Strontium levels in food and drinking water are not high enough to be able to cause these effects.