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JOHN'S CORNER:

MINERALS - The Elements and What They Do (Part 28)

by John Ferguson

36) Krypton (Kr) - Krypton is another of the "Noble" gases as it refuse to bond with other elements. In nature, krypton is a clear odorless gas. Krypton is famous for its role in the Superman comics and movies as the substance kryptonite. In reality, krypton is virtually harmless to humans and may be an essential element.

Krypton is found in igneous rocks at 0.0001 ppm and seawater at 0.0025 ppm. Most of our krypton comes from the atmosphere where it is extremely rare and occurs at 0.00011 % (1.1 ppm).

Krypton is produced by the radioactive decay of uranium in nuclear reactors.

It is used in high quality tungsten light bulbs from flashlights to incandescent lights. When energized, krypton glows bluish white making it useful for photoflashes and signage.

The isotope krypton-83 is used in MRI imaging of our lungs. In one of the rare exceptions krypton will combine with fluorine to form (KrF₂) at temperatures below -22° F where it is used to make a krypton-fluoride laser.

In science at one time, the wavelength of an emission line of krypton was used to define the length of a meter.

There has been a couple studies that found that it is associated with the amino acid isoleucine, but the relevance is unknown.

Gardening and Landscaping Problems Associated with Krypton (Kr)



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None known, good or bad

Sources: atmosphere

37) Rubidium (Rb) - The name comes from the Latin word *rubidius* which means the deepest red (ruby). No rubidium minerals are known, however it accumulates in lepidolite (a lithium bearing mineral) where it can be 1.5% of the mineral. It is found in other minerals but again uncombined chemically. Some brines have 6 ppm of rubidium.

Rubidium is found in igneous rocks at 90 ppm, shale at 140 ppm, sandstone at 60 ppm, and limestone at 3 ppm. Very little is found in fresh or seawater. In soils it can reach 100 ppm, marine plants at 7.4 ppm, land plants at 20 ppm, and in marine, or land animals at 17-20 ppm. Rubidium is a very soft metal with a silvery-white luster, it will ignite if exposed to air, and it reacts violently with water.

In humans, the highest levels occur in the liver and muscles with very little in our bones. Rubidium can replace the electrolyte function of potassium in many species from bacteria and fungi to algae and invertebrates.

Small amounts of rubidium are used in semi-conductors, a few electronic and chemical applications.

Rubidium has no direct biologic role. However, it has a small stimulatory effect on metabolism. If you note that rubidium is directly below potassium (K) on the periodic table, hence it has chemical properties that are similar and may substitute for potassium in many processes.

Rubidium is easily absorbed in our digestive system where it is found all over the body except in bones and teeth and any excess is excreted in our urine.

Gardening and Landscaping Problems Associated with Rubidium (Rb)

Plants absorb rubidium very easily since it is chemically similar to potassium.

Sugar beets if grown in a potassium deficient soil will respond to rubidium as a fertilizer. Soya beans have 220 ppm, grass has 130 ppm, apples have 50 ppm rubidium, while sweet corn only has 3 ppm. Other plants from tea and coffee also contain rubidium.



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In high concentrations, it can be toxic to plants where symptoms are dark green leaves, wilting and stunted foliage, and short brown roots.

Sources: sewage sludge (100 ppm)

38) Strontium (Sr) - Strontium is a metal in group 2 on the periodic table. It has a silvery appearance that turns yellowish after oxidation. It is a soft metal that will burn in air and reacts with water. Strontium does not occur in nature as a free element but only in a combined form with other elements.

This element is found in igneous rocks at 375 ppm, shale at 300 ppm, sandstone at 20 ppm, and limestone at 610 ppm. In fresh water at 0.08 ppm and seawater 8.1 ppm, marine plants at 260-1,400 ppm, soils at 300 ppm, land plants at 26 ppm, marine animals at 20-500 ppm and land animals at 14 ppm with the highest levels in mammal bones.

Strontium aluminates are used to make paint that glow in the dark. Strontium is used in many common products from toothpastes to televisions, ceramics, and glass manufacture. Strontium nitrate $\text{Sr}(\text{NO}_3)_2$ is used in flares and fireworks to give a strong red color.

A radioactive form or isotope of strontium (strontium-90) that does not occur in nature is formed in nuclear explosions and later is in the fall out. The radioactive isotope is known to cause bone tumors and leukemia.

Strontium has a +2 electrical or oxidation state, which is the same as calcium; hence, it is chemically similar to calcium and used in making our bones and mimics calcium in biological systems. It is required by mammals to make strong bones. As we get older, the body cannot utilize strontium as easily, which leads to weaker bones.

Deficiencies of strontium are associated with some types of calcium (Ca) and boron (B) resistant osteoporosis and arthritis.

Gardening and Landscaping Problems Associated with Strontium (Sr)

Since strontium is chemically similar to calcium (Ca) plants readily absorb it, where it tends to accumulate in the roots.



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Plants like cereal grains tend to absorb the least strontium while in alfalfa even though rare, levels up to 1,500 ppm have been measured. It is easily absorbed by tobacco plants and some mosses.

If the ratio of strontium to calcium (Ca:Sr) is less than 8, then strontium phytotoxicity may occur. Phosphorite deposits where we get phosphorus for artificial fertilizers often have over 2,000 ppm of strontium thus many artificial fertilizers have elevated levels of strontium and repeated use of these fertilizers leads to toxicity problems.

Proper levels of calcium (Ca) and magnesium (Mg) in the soil prevent excess strontium from being absorbed.

Heavy loam soils can accumulate up to 3,100 ppm of strontium while sandy soils hold very little.

Sources: burning of coal, sulfur mining, artificial fertilizers, some manures.

IN THE NEWS:

Mom's Across America has just released a new video on the dangers of GMO's and Round-Up and how it hurts our children.

https://www.youtube.com/watch?v=E_61okKFJSQ&feature=youtu.be