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JOHN'S CORNER:

MINERALS - The Elements and What They Do (Part 13)

by John Ferguson

21) Scandium (Sc) - Scandium is a soft silvery yellow-white metal that will tarnish in air and will burn easily once ignited. It is the 35th most abundant element in the earth's crust with an average of 16 ppm, and in soils at 12 ppm. It is found in igneous rocks like basalt and granite at 22 ppm, shale's at 13 ppm, sandstone, and limestone at only 1 ppm. It is a component in over 800 minerals. This is an element that is expensive not because it is rare but because it does not become concentrated in nature.

Scandium has a plus three electrical state (Sc^{+3}) which allows it to easily substitute in compounds and molecules for aluminum (Al^{+3}), iron (Fe^{+3}), titanium (Ti^{+3}), or yttrium (Y^{+3}) all of which combine in the plus three electrical state.

Scandium iodide (ScI_3) is added to mercury vapor lamps to produce a light source that resembles sunlight and is popular for use in filming. Scandium is used in lasers to televisions and other electronics. Since aluminum and scandium are chemically similar, scandium is added to aluminum to make it much stronger. This alloy is used in high performance bicycle frames, jet fighters, and baseball bats.

Scandium is found in nature in peat, coal, or crude oil, and where it concentrates in the ash when they are burned. Artificial phosphate fertilizers often contain high amounts of scandium from 7-36 ppm. Pure scandium reacts with water releasing hydrogen gas. Scandium combines with hydrogen to form scandium hydride (ScH_2), which is a good conductor of electricity for unknown reasons.

We do not know a lot about scandium, and how it affects our health. In land animals (mammals), scandium occurs at higher concentrations in the heart and bones. Scandium has been found in



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association with the amino acid proline, but the reasons are not clear. Other studies have shown that the vitamin-D molecule has to have scandium to work effectively. Other work has discovered that the human body needs adequate boron to utilize scandium.

Gardening and Landscaping Problems Associated with Scandium (Sc)

Scandium has been found in 3% of the plants tested, with vegetables having 5 ppb (parts per billion) and grasses 70 ppb while "tea" leaves can have 140 ppb.

Scandium is used as a seed germinating agent when applied as scandium sulfate ($\text{Sc}_2(\text{SO}_4)_3$) in a dilute solution to corn, peas, wheat and other plants. It increases the number of seeds successfully germinating.

Scandium content is higher in old leaves and roots as compared to younger leaves and some herbs have scandium at levels up to 2 ppm.

Note: It was interesting that a couple of the reference books that were only 15 years old stated "there is no known biological role" for scandium. However, the newer ones reported the information above. I expect as the diagnostic tools and techniques continue to improve we will find out more about this element in the future.