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JOHN'S CORNER:

MINERALS - The Elements and What They Do (Part 24)

by John Ferguson

32) Germanium (Ge): Germanium is an element that is known as a metalloid as it has properties in between those of metals and nonmetals, or that it has a mixture of metal and nonmetal properties. Germanium is a silvery white and brittle metalloid that is stable in the air and water and it is almost totally unaffected by acids. Germanium is the 50th most abundant element on earth.

Germanium is found in igneous rocks at 5.4 ppm, shale's at 1.6 ppm, and very little in sandstones and limestone's. In soils, it is found mainly in the humus component at 1-2 ppm. There is extremely little germanium in fresh or seawater at 0.00007 ppm. In marine animals, it can reach 0.3 ppm. During weathering germanium is easily mobilized as germanous hydroxide $\text{Ge}(\text{OH})_2$ and is readily absorbed from aquatic systems by clay minerals, iron oxides and organic matter removing it from the water.

The most common (and stable) electrical or oxidation state is +4, although it can be found at the +2 electrical state in some compounds. Germanium is in the same column on the periodic table as silicon (Si) hence it easily substitutes for silicon (Si) in many minerals and will form complexes with oxygen (O). In nature, germanium is found in association with sulfide ores of copper, lead, and zinc. Significant amounts of germanium are often found in ash and flue dust created from the burning of coal.

The first semi conductors were made with germanium and not silicon, as it did not require the high purity of silicon to work. Germanium was used as the critical element in early diodes and transistors. Additionally germanium oxide was used as a catalyst in the manufacture of polyester.



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Germanium has some interesting properties, unlike metals; germanium grows crystals as it cools from its liquid state. Germanium has the unique property that it is opaque in visible light but is transparent in infrared light. Germanium is required for televisions, computer screens, computer chips, optical fibers, solar cells, and infrared optical systems.

Germanium compounds (salts) generally have a low toxicity for mammals, but are toxic to some forms of bacteria but there is no practical application so far. It is considered a micronutrient, and some studies indicate that it will retard or prevent the growth of cancers in humans. Germanium is known to enhance the human immune system by stimulating production of several types of natural killer cells. Organic compounds of germanium are used in chemotherapy and as a strong pain reliever in Asian medicine.

A Japanese researcher has found that many herbs with healing properties are accumulators for the element germanium. Most of our food plants contain very little germanium (2-5 ppm), however healing herbs such as garlic, aloe, comfrey, chlorella, ginseng, watercress, Shitake mushroom, and others contain 100-2,000 ppm. The "Holy waters" at Lourdes, France is known worldwide for their healing properties, which contains large amounts of germanium.

Germanium being a semi-conductor (both accepts and gives off electrons), it is a highly efficient electrical impulse initiator intracellularly, and germanium acts as a metallic cofactor for oxygen utilization. This allows organs to attract and use oxygen more efficiently.

Deficiencies of germanium are reduced immune status, arthritis, osteoporosis, low energy, and cancer. A few others health issues that are being linked to germanium deficiency are cirrhosis, neuralgia, leukemia, hypertension, softening of brain tissue, and cardiac insufficiency.

The human body rapidly excretes germanium in our urine hence it needs to be replaced from our food supply daily.



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Gardening and Landscaping Problems Associated with Germanium (Ge)

Blue-green algae and diatoms will accumulate germanium in their tissues, as will some of the herbs mentioned above. Germanium is not believed to be an essential element for plants; however, plants easily absorb it.

High levels of germanium have been found to be toxic to many plants as there is evidence that germanium can substitute for the silicon required by many of plant metabolic processes, which disrupts these processes.

Sources: compost, basalt sand, some humates, some coal ash.