

**\* Name Origin:**

From Vanadis Scandinavian goddess.

**\* Sources:**

Found in the minerals patronite ( $\text{VS}_5$ ), vanadinite [ $\text{Pb}_5(\text{VO}_4)_3\text{Cl}$ ], and carnotite [ $\text{K}_2(\text{UO}_2)_2(\text{VO}_4)_2 \cdot 3\text{H}_2\text{O}$ ].

**\* Uses:**

It is mixed with other metals to make very strong and durable alloys which are used in construction materials, tools, springs and jet engines. Vanadium pentoxide ( $\text{V}_2\text{O}_5$ ) is used as a catalyst, dye and color-fixer.

**\* Additional Notes:**

Vanadium was first discovered by del Rio in 1801. Unfortunately, a French chemist incorrectly declared del Rio's new element was only impure chromium; del Rio thought himself to be mistaken and accepted the French chemist's statement. The element was rediscovered in 1830 by Sefstrom, who named the element in honor of the Scandinavian goddess Vanadis because of its beautiful multicolored compounds. It was isolated in nearly pure form by Roscoe, in 1867, who reduced the chloride with hydrogen. Vanadium of 99.3 to 99.8% purity was not produced until 1927. Vanadium is found in about 65 different minerals among which are carnotite, roscoelite, vanadinite, and patronite important sources of the metal. Vanadium is also found in phosphate rock and certain iron ores, and is present in some crude oils in the form of organic complexes. It is also found in small percentages in meteorites. Commercial production from petroleum ash holds promise as an important source of the element. High-purity ductile vanadium can be obtained by reduction of vanadium trichloride with magnesium or with magnesium-sodium mixtures. Much of the vanadium metal being produced is now made by calcium reduction of  $\text{V}_2\text{O}_5$  in a pressure vessel, an adaption of a process developed by McKechnie and Seybolt. Natural vanadium is a mixture of two isotopes,  $^{50}\text{V}$  (0.25%) and  $^{51}\text{V}$  (99.75%).  $^{50}\text{V}$  is slightly radioactive, having a long half-life. Seventeen other unstable isotopes are recognized. Pure vanadium is a bright white metal, and is soft and ductile. It has good corrosion resistance to alkalis, sulfuric and hydrochloric acid, and salt water, but the metal oxidizes readily above  $660^\circ\text{C}$ . The metal has good structural strength and a low fission neutron cross section, making it useful in nuclear applications. Vanadium is used in producing rust resistant, spring, and highspeed tool steels. It is an important carbide stabilizer in making steels. About 80% of the vanadium now produced is used as ferrovanadium or as a steel additive. Vanadium foil is used as a bonding agent in cladding titanium to steel. Vanadium pentoxide is used in ceramics and as a catalyst. It is also used in producing a superconductive magnet with a field of 175,000 gauss. Vanadium and its compounds are toxic and should be handled with care. Ductile vanadium is commercially available.