Tantalum: History, Properties and Uses by Judy

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Tantalum is represented on the periodic table by the symbol Ta and has the atomic number 73. Tantalum was called tantalium previously, which comes from the character in Greek mythology, Tantalus. Tantalum is one of the elements in the refractory metals group. Refractory metals are often used as small components in alloys. It is a transition metal that is hard and blue-gray in color. It is also very rare.

History

In 1802, Anders Ekeberg discovered the element tantalum in Sweden. A year before, Charles Hatchett, had discovered columbium. William Hyde Wollaston, compared oxides taken from columbium and tantalum and discovered they were identical. This occurred in 1809 and he chose the name tantalum. The results were confirmed by Friedrich Wohler and columbium and tantalum were considered the same element.

Physical Properties

Tantalum has a dark blue-gray color, and is dense, extremely hard, ductile, easily fabricated, and extremely conductive of both electricity and heat. Tantalum is well-known for the corrosion resistance to acids. At temperatures that are below 150 degree Celsius, the metal resists attack by aqua regia. Tantalumâ€™s melting point is 3017 degrees Celsius. The only metals with higher melting points are rhenium, tungsten, and osmium.

There are two crystalline phases that tantalum exists in, alpha and beta. During the alpha phase it is relatively soft and ductile, has a cubic structure that is body-centered, and has Knoop hardness of 200 to 400 HN. The electrical resistivity is 15-60. During the beta phase it is hard and brittle, has a crystal symmetry that is tetragonal, a Knoop hardness of 1000 to 1300 HN. The electrical resistivity is somewhat high between 170 and 210.

Chemical Properties

Tantalum pentoxide is the most stable form of tantalum in an oxidation state. These compounds are created through dissolving of pentoxide in a basic hydrogen solution or by melting it in some type of metal oxide. Examples of this are lanthanum tantalite and lithium tantalite.

Tantalum Uses

The most common use for the metal powder form of tantalum is for producing components in electronics. These are used mostly in some more high powered resisters as well as capacitors. Tantalum has a size and weight advantage over some of the other elements and for this reason it is used in devices such as portable phones, automotive electronics, and for personal computers.

There are many types of alloys that use tantalum as well. The alloys created with tantalum have extremely high melting points, are very strong, and have good ductility. When alloyed with other metals, tantalum is used to make carbide tools that are used for metalworking equipment. It is also used to create superalloys which are used in chemical process equipment, jet engine components, missile parts, and nuclear reactors. The ductility of tantalum allows it to be made into fine wires and filaments. This can be used to evaporate metals such as aluminum.

There are several other applications that tantalum is used for. The oxide is uses for making a special refractive index glass that is used in camera lenses.

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