Titanium: History and Properties by Judy

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Titanium has the atomic number 22 and is identified with the symbol Ti. It is a chemical element. Some of the features of titanium include that it is corrosion resistant in elements such as chlorine and sea water, it is strong, and has a very low density. Titanium is silver in color and is a transition metal.

History

Titanium was first discovered in 1791 in Cornwall, United Kingdom. William Gregor, who was the vicar of the Creed parish, a pastor, and an amateur geologist, is credited with the discovery. When he found black sand near a stream in the Manaccan parish, he noticed the presence of a new element.

When Gregor examined the sand he notices the presence of two different metal oxides, the first was iron oxide, which explained why it was attracted to the magnet that he used. The second was a white metallic oxide that he was unable to identify. He realized that the oxide contained a metal that was not a match to any of the currently recorded elements and thus reported the findings to the Royal Geological Society of Cornwall.

Extracting the titanium from the ores was found to be extremely laborious as well as costly. The normal manner of reducing the ore through heating it in the presence of carbon could not be used as that would produce titanium carbide. The pure metallic titanium was not prepared until 1910 by Matthew Hunter. He was able to do this by heating TiCl4 with sodium. He used the temperature between 700 and 800 degrees Celsius for the process, which is now referred to as the Hunter process. The titanium metal was not used until 1932 when William Justin Kroll came up with the Kroll process that uses sodium and calcium to produce the metal. There is still research being done to come up with cheaper and more efficient process, but the Kroll process is typically what is used for commercial production of titanium.

Physical Properties

Titanium is most well â€“known for the strength to weight ratio it offers as a metallic element. Titanium is extremely strong and has a low density, which is quite ductile. It is metallic â€“ white in color and extremely lustrous. Titanium also has a very high melting point at above 1650 degrees Celsius, which makes it extremely useful as a refractory metal. The metal has a low thermal and electrical conductivity.

Commercial grades of titanium have the strength of approximately 63,000 psi. This is around the same amount as the more common steel alloys that are low grade. However, titanium weighs approximately 45% less than steel. Titanium is twice as strong as aluminum and 60% more dense. There are some forms of titanium alloys that can achieve tensile strength of over 200,000 psi. However, when heated above 430 degrees Celsius, it starts to lose its strength.

Titanium is somewhat hard, but not as hard as most steel. It is not magnetic and is a poor conductor for both electricity and heat. If it is not properly cooled or sharp tools are used it can soften and gall during machining.

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