

Gadolinium Encyclopedia Article

Gadolinium

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Gadolinium

Gadolinium is a rare earth element, one of the elements that occurs in Row 6 of the **periodic table** between **barium** (atomic number 56) and **hafnium** (atomic number 72). Its **atomic number** is 64, its atomic **mass** is 157.25, and its chemical symbol is Gd.

Properties

Gadolinium is a typical metal with a shiny metallic luster and a slightly yellowish tint. It is both ductile and malleable. It has a melting point of 2,394°F (1,312°C), a **boiling point** of about 5,400°F (3,000°C), and a **density** of 7.87 grams per cubic centimeter. Gadolinium is strongly magnetic and has the highest neutron-absorbing ability of any element. The element is not particularly reactive, although it does react slowly with cold **water**, it dissolves in most acids, and it reacts with **oxygen** at high temperatures.

Occurrence and Extraction

Gadolinium is a relatively common element with an abundance of about 4.5-6.4 parts per million, belying its classification as a "rare earth element." The term "rare earth" actually refers more to the difficulty of separating the elements in this family from each other rather than their relative abundance in the Earth's crust. Gadolinium is extracted from its ores by being converted first to gadolinium chloride (GdCl_3) or gadolinium fluoride (GdF_3) and then being electrolyzed: $2\text{GdCl}_3 \xrightarrow{\text{electric current}} 2\text{Gd} + 3\text{Cl}_2$.

Discovery and Naming

Gadolinium was discovered in 1880 by the French chemist Jean-Charles Galissard de Marignac (1817-1894). The element was found in a complex mineral called cerite that had first been discovered in 1803. Over nearly a century, chemists continued to analyze cerite, eventually discovering a total of seven new elements in it. The element was named for Finnish chemist Johan Gadolin (1760-1852) who conducted some of the earliest research on cerite.

Uses

Because of its neutron-absorption capacity, gadolinium is used in the manufacture of control rods for nuclear power plants. Compounds of the element are also used to make phosphors that coat the screen of television tubes and CRTs (cathode ray tubes). Gadolinium is also used in the manufacture of synthetic minerals known as gadolinium **yttrium** garnets, used in microwave ovens.