Yttrium Encyclopedia Article

Yttrium

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Contents

Yttrium Encyclopedia Article.....1

Contents.....2

Yttrium.....3

Yttrium

Yttrium is a transition metal element denoted by the atomic symbol, Y. It has an atomic number of 39 and the average atomic weight of its isotopes is 88.90585. It is an iron-grey, powder that has a melting point of 2778.8°F (1526°C) and a boiling point of 6036.8°F (3336°C). Compared to other transition metals, yttrium is a relatively active metal that decomposes in cold water slowly and boiling water rapidly. Its metal turnings may ignite spontaneously in air.

While yttrium is not itself a rare earth element its history is closely tied to that of the rare earths, and its chemical properties are similar to those of the members of that family. It also occurs in close association in nature with the rare earths. Yttrium was the first new element to be identified in the complex mineral called ytterite (now known as gadolinite), discovered in 1787. Johan Gadolin analyzed the dense black mineral and realized that it contained a new substance. That substance was further analyzed by the Swedish chemist Anders Gustav Ekeberg in 1799 and given the name of yttria. Over the next twelve years, yttria was shown to contain nine other elements in addition to yttrium itself. An impure form of the element was produced by Friedrich Wöhler in 1828.

The commercial production of yttrium begins with mining of monazite sand. This mineral contains approximately 3% yttrium. It is then purified by reduction with a calcium metal.

Yttrium is used in alloys to decrease grain size or add strength. Its greatest use, in the for of yttrium oxide, is in television phosphors. When doped with erbium, the phosphors produce a red glow. Synthetic garnets containing yttrium are very hard and have been used as gemstones that are similar to diamonds. The garnets are also used in microwave filters and in lasers. Compounds containing yttrium have been shown to become superconducting at relatively high temperatures. Such uses could conceivably become the most important application of the element in the future.