Rhenium is a dense, silvery white metal that takes its name from the Latin, Rhenus, for the Rhine river. It was discovered in 1925 by Ida and Walter Noddack along with Otto Berg. (L. *Rhenus*: Rhine) Discovery of rhenium is generally attributed to Noddack, Tacke, and Berg, who announced in 1925 they had detected the element in platinum ore and columbite. They also found the element in gadolinite and molybdenite. By working up 660 kg of molybdenite in 1928 they were able to extract 1 g of rhenium.

Rhenium was another of the "missing" elements proposed by Mendeleev. The first sample was concentrated 100,000 fold from a gadolinium ore sample. Just enough was obtained for a spectroscopic study in which previously unseen lines were observed. The metal is acid resistant and has one of the highest melting points. But its scarcity (and therefore expense) makes practical use limited.

Sources

Rhenium does not occur free in nature or as a compound in a distinct mineral species. It is, however, widely spread throughout the earth’s crust to the extent of about 0.001 ppm. Commercial rhenium in the U.S. today is obtained from molybdenum roaster-flue dusts obtained from copper-sulfide ores mined in the vicinity of Miami, Arizona and elsewhere in Arizona and in Utah.

Some molybdenum contains from 0.002% to 0.2% rhenium. More than 150,000 troy ounces of rhenium are now being produced yearly in the United States. The total estimated Free World reserve of rhenium metal is 3500 tons. Rhenium metal is prepared by reducing ammonium perrhentate with hydrogen at elevated temperatures.

Isotopes

Natural rhenium is a mixture of two stable isotopes. Twenty six other unstable isotopes are recognized.

Properties

The element is silvery white with a metallic luster; its density is exceeded only by that of platinum, iridium, and osmium, and its melting point is exceeded only by that of tungsten and carbon. It is nearly twice as dense as lead (21 g/cm3) and extremely rare (1 pound of rhenium per 1000 million pounds of earth!!!). Nonetheless, the total annual U.S. production of Re is almost half a ton. It is used as a trace alloying element for metal components that are subject to constant friction.

The usual commercial form of the element is powder, but it can be consolidated by pressing and resistance-sintering in a vacuum or hydrogen atmosphere. This process produces a compact shape in excess of 90 percent of the density of the metal.

Annealed rhenium is very ductile, and can be bent, coiled, or rolled. Rhenium is used as an additive to tungsten and molybdenum -based alloys to impart useful properties.
Uses

It is widely used as filaments for mass spectrographs and ion gauges. Rhenium-molybdenum alloys are superconductive at 10 K.

Rhenium is also used as an electrical contact material because it has good wear resistance and withstands arc corrosion. Thermocouples made of Re-W are used for measuring temperatures up to 2200°C, and rhenium wire is used in photoflash lamps for photography.

Rhenium catalysts are exceptionally resistant to poisoning from nitrogen, sulfur, and phosphorus, and are used for hydrogenation of fine chemicals.

Hazards

Because little is known about its toxicity, it should be handled with care until more data becomes available.

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