

Rhenium

Rhenium is a chemical element with the symbol Re and atomic number 75. It is a silvery-white, heavy, third-row transition metal in group 7 of the periodic table. With an average concentration of 1 part per billion (ppb), rhenium is one of the rarest elements in the Earth's crust. The free element has the third-highest melting point and highest boiling point of any element. Rhenium resembles manganese chemically and is obtained as a by-product of molybdenum and copper refinement. Rhenium shows in its compounds a wide variety of oxidation states ranging from -1 to $+7$.

Discovered in 1925, rhenium was the last stable element to be discovered. It was named after the river Rhine in Europe.

Nickel-based superalloys for use in jet engines contain up to 6% rhenium, making jet engine construction the largest use for the element, with chemical industry catalytic uses being next-most important. Because of the low availability relative to demand, rhenium is among the most expensive industrial metals, with an average price of approximately US\$4,575 per kilogram, on 1 August 2011.

Rhenium (Latin: Rhenus meaning: "Rhine") was the last element to be discovered having a stable isotope (other new radioactive elements have been discovered in nature since then, such as neptunium and plutonium). The existence of a yet undiscovered element at this position in the periodic table had been first predicted by Dmitry Mendeleev. Other calculated information was obtained by Henry Moseley in 1914. It is generally considered to have been discovered by Walter Noddack, Ida Tacke, and Otto Berg in Germany. In 1925 they reported that they detected the element in platinum ore and in the mineral columbite. They also found rhenium in gadolinite and molybdenite. In 1928 they were able to extract 1 g of the element by processing 660 kg of molybdenite. The process was so complicated and expensive that production was discontinued until early 1950 when tungsten-rhenium and molybdenum-rhenium alloys were prepared. These alloys found important applications in industry that resulted in a great demand for the rhenium produced from the molybdenite fraction of porphyry copper ores.

Rhenium is a silvery-white metal with one of the highest melting points of all elements, exceeded by only tungsten and carbon. It is also one of the densest, exceeded only by platinum, iridium and osmium.

Its usual commercial form is a powder, but this element can be consolidated by pressing and sintering in a vacuum or hydrogen atmosphere. This procedure yields a compact solid having a density above 90% of the density of the metal. When annealed this metal is very ductile and can be bent, coiled, or rolled. Rhenium-molybdenum alloys are superconductive at 10 K; tungsten-rhenium alloys are also superconductive around 4-8 K, depending on the alloy.

(Information from Wikipedia)