

# Protactinium Encyclopedia Article

## Protactinium

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# Protactinium

Protactinium is an actinide series element denoted by the atomic symbol, Pa. It has an atomic number of 91 and the average atomic weight of its isotopes is 231.03588. It is a metallic solid that is malleable and ductile with a bright, silvery luster. It has a melting point of 2861.6°F (1572°C). Protactinium is a radioactive material that is extremely toxic.

The discovery of protactinium was a result of work done on radium. The discovery of radium in 1898 created a host of new problems for chemists. Within a short period of time, more than forty new chemical element-like substances were discovered in the decay products of uranium and radium. It was clearly impossible that all of these new substances were elements. Chemists assigned names such as uranium-I, uranium-X, uranium-X<sub>2</sub>, radium-A, radium-B, radium-C, and radium-C to these substances.

For the next fifteen years, chemists tried to identify these substances and arrange them in their proper positions in the periodic table. Only when Frederick Soddy developed the concept of isotopes in 1913 was the character of these radioactive materials clarified.

One of the positions that was still open in the periodic table was number 91. As early as 1871, Dmitry Mendeleev had predicted the discovery of eka-tantalum, an element below tantalum in the table in space 91. In 1913, Kasimir Fajans (1887-1975) and O. H. Göhring claimed discovery of an element for this position. They named the element brevium because of its short half life of 1.175 minutes. The material had been known to that time as uranium-X<sub>2</sub>.

Five years later, a longer-lived isotope of the element with a half life of  $3.25 \times 10^4$  years was discovered in pitchblende by Lise Meitner and Otto Hahn and, independently by Soddy, John A. Cranston, and A. Fleck. The name *protoactinium*--later changed to *protactinium*--was assigned to the element. The pure metal was first prepared in 1934 by Aristide V. Grosse (1905-).

A few protactinium compounds have been produced which are colored. However, protactinium is one of the rarest, naturally occurring materials, and no commercial uses have as yet been found for it.