

## Uranium

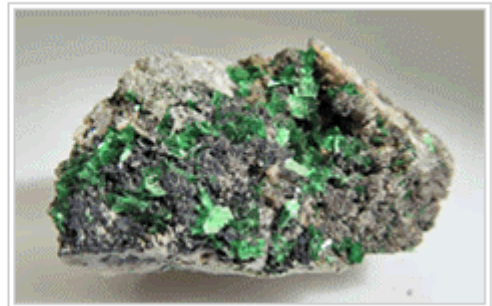
The metallic element Uranium (U) is the source for most of the world's reactor fuel. It was first discovered by the German chemist Martin Klaproth in 1789 and isolated as a metal by the French chemist Eugene-Melchior Peligot in 1841. It is a hard, grey metal, which can be machined and cast.

Uranium is as common in the earth's crust as tin or tungsten, occurring in most rocks in concentrations of 2 to 4 parts per million (ppm) – although granite can contain as much as 8ppm. The top 25km of the Earth's crust contain about 450 trillion tonnes of uranium; the oceans contain about 45 billion tonnes.

The world has a reserve of about 2 million tonnes of ores which are more than 0.1% uranium. Uranium is mined in the USA, Canada, Australia, South Africa (as a by-product of gold mining), Namibia, Zaire, Gabon and in smaller quantities within the EC.

In 1896 Henri Becquerel, another Frenchman, discovered that uranium undergoes radioactive decay. The discovery of fission in 1939 by the German scientists Otto Hahn, Fritz Strassman and Lise Meitner made uranium a very important element.

### Uranium Ore



Uranium is one of a group of radioactive elements known as the Actinides, which also include plutonium. Uranium has 92 protons in its nucleus, giving it an atomic number of 92, and occurs in three natural isotopes:

U-234 (92 protons + 142 neutrons) with a half-life of 245,000 years

U-235 (92 protons + 143 neutrons) half-life 70,000,000 years

U-238 (92 protons + 146 neutrons) half-life 4,500,000,000 years

The form of uranium used as fuel in thermal reactors is enriched uranium dioxide ( $UO_2$ ). Enrichment increases the proportion of the fissile uranium-235 isotope from its natural level of 0.7% to 3-4%. This enables greater technical efficiency in reactor design and operation, particularly in larger reactors, and allows the use of ordinary water as a possible moderator.

As well being used as fuel in the nuclear industry, Uranium's high density (40% > lead) has led to it being used in the keels of yachts and as counterweights for aircraft control surfaces such as rudders and elevators.