= Uranium =

Uranium is a chemical element with symbol U and atomic number 92 . It is a silvery @-@ white metal in the actinide series of the periodic table . A uranium atom has 92 protons and 92 electrons , of which 6 are valence electrons . Uranium is weakly radioactive because all its isotopes are unstable (with half @-@ lives of the six naturally known isotopes , uranium @-@ 233 to uranium @-@ 238 , varying between 69 years and 4 @.@ 5 billion years) . The most common isotopes in natural uranium are uranium @-@ 238 (which has 146 neutrons and accounts for over 99 %) and uranium @-@ 235 (which has 143 neutrons) . Uranium has the second highest atomic weight of the primordially occurring elements , lighter only than plutonium . Its density is about 70 % higher than that of lead , and slightly lower than that of gold or tungsten . It occurs naturally in low concentrations of a few parts per million in soil , rock and water , and is commercially extracted from uranium @-@ bearing minerals such as uraninite .

In nature , uranium is found as uranium @-@ 238 (99 @.@ 2739 ? 99 @.@ 2752 %) , uranium @-@ 235 (0 @.@ 7198 ? 0 @.@ 7202 %) , and a very small amount of uranium @-@ 234 (0 @.@ 0050 ? 0 @.@ 0059 %) . Uranium decays slowly by emitting an alpha particle . The half @-@ life of uranium @-@ 238 is about 4 @.@ 47 billion years and that of uranium @-@ 235 is 704 million years , making them useful in dating the age of the Earth .

Many contemporary uses of uranium exploit its unique nuclear properties . Uranium @-@ 235 has the distinction of being the only naturally occurring fissile isotope . Uranium @-@ 238 is fissionable by fast neutrons , and is fertile , meaning it can be transmuted to fissile plutonium @-@ 239 in a nuclear reactor . Another fissile isotope , uranium @-@ 233 , can be produced from natural thorium and is also important in nuclear technology . Uranium @-@ 238 has a small probability for spontaneous fission or even induced fission with fast neutrons ; uranium @-@ 235 and to a lesser degree uranium @-@ 233 have a much higher fission cross @-@ section for slow neutrons . In sufficient concentration , these isotopes maintain a sustained nuclear chain reaction . This generates the heat in nuclear power reactors , and produces the fissile material for nuclear weapons . Depleted uranium (238U) is used in kinetic energy penetrators and armor plating . Uranium is used as a colorant in uranium glass , producing lemon yellow to green colors . Uranium glass fluoresces green in ultraviolet light . It was also used for tinting and shading in early photography .

The 1789 discovery of uranium in the mineral pitchblende is credited to Martin Heinrich Klaproth , who named the new element after the planet Uranus . Eugène @-@ Melchior Péligot was the first person to isolate the metal and its radioactive properties were discovered in 1896 by Henri Becquerel . Research by Otto Hahn , Lise Meitner , Enrico Fermi and others , such as J. Robert Oppenheimer starting in 1934 led to its use as a fuel in the nuclear power industry and in Little Boy , the first nuclear weapon used in war . An ensuing arms race during the Cold War between the United States and the Soviet Union produced tens of thousands of nuclear weapons that used uranium metal and uranium @-@ derived plutonium @-@ 239 . The security of those weapons and their fissile material following the breakup of the Soviet Union in 1991 is an ongoing concern for public health and safety . See Nuclear proliferation .

= = Characteristics = =

When refined , uranium is a silvery white , weakly radioactive metal . It has a Mohs hardness of 6 , sufficient to scratch glass and approximately equal to that of titanium , rhodium , manganese and niobium . It is malleable , ductile , slightly paramagnetic , strongly electropositive and a poor electrical conductor . Uranium metal has a very high density of 19 @.@ 1 g / cm3 , denser than lead (11 @.@ 3 g / cm3) , but slightly less dense than tungsten and gold (19 @.@ 3 g / cm3) .

Uranium metal reacts with almost all non @-@ metal elements (with an exception of the noble gases) and their compounds , with reactivity increasing with temperature . Hydrochloric and nitric acids dissolve uranium , but non @-@ oxidizing acids other than hydrochloric acid attack the element very slowly . When finely divided , it can react with cold water ; in air , uranium metal becomes coated with a dark layer of uranium oxide . Uranium in ores is extracted chemically and

converted into uranium dioxide or other chemical forms usable in industry .

Uranium @-@ 235 was the first isotope that was found to be fissile . Other naturally occurring isotopes are fissionable , but not fissile . On bombardment with slow neutrons , its uranium @-@ 235 isotope will most of the time divide into two smaller nuclei , releasing nuclear binding energy and more neutrons . If too many of these neutrons are absorbed by other uranium @-@ 235 nuclei , a nuclear chain reaction occurs that results in a burst of heat or (in special circumstances) an explosion . In a nuclear reactor , such a chain reaction is slowed and controlled by a neutron poison , absorbing some of the free neutrons . Such neutron absorbent materials are often part of reactor control rods (see nuclear reactor physics for a description of this process of reactor control) .

As little as 15 lb (7 kg) of uranium @-@ 235 can be used to make an atomic bomb . The first nuclear bomb used in war , Little Boy , relied on uranium fission , but the very first nuclear explosive (the Gadget used at Trinity) and the bomb that destroyed Nagasaki (Fat Man) were both plutonium bombs .

Uranium metal has three allotropic forms :