

## Plutonium



Plutonium is an artificial metal, produced in reactors by the neutron irradiation of uranium-238. There are 15 isotopes (same chemical properties, but different nuclear properties), all of which are radioactive. In the irradiated fuel rods removed from reactors, Pu-239 is the most important in mass, followed by other isotopes : Pu-238, Pu-240 and Pu-241. Plutonium isotopic composition varies according to the reactor's fuel type and burn-up. At higher burn-up, proportion of fissile plutonium-239 decreases and that of the minority isotopes increases.

Plutonium is extracted from irradiated fuel in a reprocessing plant using chemical processes.

### Civil use

The two isotopes used are Pu-239 and Pu-238. Plutonium-239 can be mixed with slightly enriched uranium for use in nuclear power reactors. The minority Pu-238 isotope is used in electrical generators built for satellites and space probes.

### Military use

Military applications require plutonium that mainly contains fissile Pu-239. Low burn-up is needed to produce this isotope in a reactor, and this was possible in specific facilities such as the French G1, G2 and G3 reactors.



### Plutonium toxicity

Unlike uranium whose toxicity is primarily chemical, plutonium toxicity is mainly radiological.

When purified, weapons-grade plutonium only contains a small amount of minority isotopes and is moderately radioactive. The health risk is mainly linked to ingesting or inhaling plutonium particles, which can attach to lungs, liver or skeleton, potentially causing cancer in the long term. As a result, plutonium must be handled in a glove box.