

# Isotopes and their uses



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Isotopes Any of two or more forms of a chemical element, having the same number of protons in the nucleus, but having different numbers of neutrons are called isotopes. Some isotopes are unstable, especially those with a lot of neutrons compared to the number of protons in the nucleus. These isotopes tend to eject some particles, in the form of radiation, until a stable nucleus is produced; this is called the radioactive decay. Four isotopes as well as their uses are mentioned subsequently.

Americium: Americium is a silvery metal, which corrodes slowly in air and is soluble in acid. It has the isotopes: Am-243, Am-242 and Am-241, with a half-life of 432 years, which was the first isotope to be isolated. The isotope Am-241 decays by emitting alpha particles and intense gamma radiation to become neptunium-237. Americium (in combination with beryllium) is also used as a neutron source in non-destructive testing of machinery and equipment, and as a thickness gauge in the glass industry.

However, its most common application is as an ionization source in smoke detectors, and most of the several kilograms of americium made each year are used in this way. One gram of americium oxide provides enough active material for more than three million household smoke detectors. Krypton: Krypton 85 (Kr-85) is a radioisotope of krypton. It is a radioactive gas found in the atmosphere and produced by nuclear explosions, nuclear power plants, volcanoes and earthquakes. Krypton-85 is odorless, colorless and tasteless and emits low-level radiation levels of both gamma and beta rays.

Krypton-85 is usually produced in gas mixtures with argon or xenon to improve the ionization in light bulbs by reducing their starting voltage. It also

is used in plasma displays, spark gaps and for leak detection. Strontium: Strontium-90 is a radioactive isotope, with a half-life of 28.8 years. Sr-90 finds extensive use in medicine and industry, as a radioactive source for superficial radiotherapy of some cancers. Controlled amounts of this isotope can be used in treatment of bone cancer. As the radioactive decay of strontium-90 generates significant amount of heat, it is used as a heat source in radioisotope thermoelectric generators, this is a device where heat released by the decay of a radioactive material is converted into electricity. It is also used as a radioactive tracer in medicine and agriculture. Thorium: Thorium-230 is a radioactive isotope of thorium, which can be used to date corals and determine ocean current flux. Ionium was a name given early in the study of radioactive elements to the Th-230 isotope produced in the decay chain of U-238 before it was realized that ionium and thorium are chemically identical. The symbol Io was used for this supposed element.