

Factsheets & FAQs

Polonium-210

Basic Facts

Polonium-210 (Po-210) is a radioactive element that occurs naturally and is present in the environment at extremely low concentrations.

Polonium was discovered by Marie Skłodowska-Curie and Pierre Curie in 1898 and was named after Marie's native land of Poland (Latin: Polonia). This element was the first one discovered by them while they were investigating the cause of pitchblende radioactivity.

It is a fairly volatile (50% is vaporized in air in 45 hours at 55°C) silvery-grey soft metal.

Po-210 has a half-life of 138 days. This is the time it takes for the activity to decrease by half due to a process of radioactive decay. Po-210 decays to stable lead-206 by emitting alpha particles, accompanied by very low intensity gamma rays. The majority of the time Po-210 decays by emission of alpha particles only, not by emission of an alpha particle and a gamma ray. Only about one in a 100,000 decays results in the emission of a gamma ray. Alpha spectroscopy is the best method of measuring this isotope.

Origin

Being produced during the decay of naturally occurring uranium-238, polonium-210 is widely distributed in small amounts in the earth's crust. Although it can be produced by the chemical processing of uranium ores or minerals, uranium ores contain less than 0.1 mg Po-210 per ton. Because Po-210 is produced from the decay of radon-222 gas, it can be found in the atmosphere from which it is deposited on the earth's surface. Although direct root uptake by plants is generally small, Po-210 can be deposited on broad-leaved vegetables. Deposition from the atmosphere on tobacco leaves results in elevated concentrations of Po-210 in tobacco smoke. There are tiny amounts of Po-210 in our bodies.

Po-210 can be manufactured artificially by irradiating stable bismuth-209 with thermal neutrons resulting in the formation of radioactive Bi-210, which decays (half-life 5 days) into Po-210. Polonium may now be made in milligram amounts in this procedure which uses high neutron fluxes found in nuclear reactors. Only about 100 grams are produced each year, making polonium exceedingly rare.

Uses

Po-210 is used in neutron sources (where it is mixed or alloyed with beryllium). It is also used in devices that eliminate static electricity in machinery where it can be caused by processes such as paper rolling, manufacturing sheet plastics, and spinning synthetic fibres. Brushes containing Po-210 are used to remove accumulated dust from photographic films and camera lenses. Static eliminators typically contain from one to tens of GBq of radioactivity.

Po-210 emits so many alpha particles each second that the energy released from one gram is 140 watts, and a capsule containing about half a gram will spontaneously reach a temperature of 500°C. As a result it has been used as a lightweight heat source to power thermoelectric

cells in satellites. A Po-210 heat source was also used in each of the Lunokhod rovers deployed on the surface of the Moon, to keep their internal components warm during the lunar nights. However, because of its short half-life Po-210 cannot provide power for long-term space missions and has been phased out of use in this application. Polonium is not subject to IAEA safeguards.

Toxicity

Po-210 is highly radioactive and chemically toxic element. Direct damage occurs from energy absorption into tissues from alpha particles. As an alpha-emitter Po-210 represents a radiation hazard only if taken into the body. It's important to note that alpha particles do not travel very far - no more than a few centimetres in air. They are stopped by a sheet of paper or by the dead layer of outer skin on our bodies. Therefore, external exposure from Po-210 is not a concern and Po-210 does not represent a risk to human health as long as Po-210 remains outside the body. Most traces of it on a person can be eliminated through careful hand-washing and showering.

Po-210 can enter the body through eating and drinking of contaminated food, breathing contaminated air or through a wound. The biological half-time (the time for the level of Po-210 in the body to fall by half) is approximately 50 days. If taken into the body, Po-210 is subsequently excreted, mostly through faeces but some is excreted through urine and other pathways. People who come into contact with a person contaminated by Po-210 will not be at risk unless they ingest or inhale bodily fluids of the contaminated person.

Responsible/Contact: Office of Public Information and Communication

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