Polonium-210

(^{210}Po)

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WHO DISCOVERED POLONIUM?

Polonium, element number 84 on the periodic chart, was discovery by Marie Curie, a Polish chemist, in 1898. She obtained polonium from pitchblend, a material that contains uranium, after noticing that unrefined pitchblend was more radioactive than the uranium that it was separated from. One ton of uranium ore contains only about 100 micrograms (0.0001 grams) of polonium. She named polonium after her homeland of Poland.

Polonium, symbol Po, has atomic number 84 and atomic weight 209. Metallic polonium is a silvery metal which is soluble in dilute acids. It has a low melting temperature (254^{o}C, 489^{o}F) but is fairly volatile at temperatures as low as 55^{o}C (131^{o}F). Over 25 isotopes of polonium are known, none of which are stable. Its four longest lived isotopes are: polonium-206 (8.8 days), polonium-208 (2.898 years), polonium-209 (102 years), and polonium-210 (138 days). Polonium-210 is the predominant naturally occurring isotope and the one most widely used.

WHAT IS POLONIUM-210 USED FOR?

Polonium can also be used to eliminate static charges in machinery where it can be caused by processes such as paper rolling, manufacturing sheet plastics, and spinning synthetic fibers. It is also used in brushes that remove accumulated dust from photographic films and lenses. Polonium is electroplated onto a backing foil and inserted into a brush, tube, or other holder.

Polonium can be mixed or alloyed with beryllium to be used as a neutron source. Polonium emits an alpha particle as it decays. The beryllium absorbs the alpha particle and emits a neutron. This combination has been used as a neutron source for nuclear weapons.

It has also been used as a lightweight heat source to power thermoelectric cells.

WHERE DOES POLONIUM-210 COME FROM AND WHERE IS IT FOUND?

Polonium, initially called “Radium F”, is a decay product of radium in the uranium decay chain. It can be made commercially by bombarding bismuth-209 with neutrons in a nuclear reactor. This forms bismuth-210 which has a half-life of 5 days. Bismuth-210 decays to polonium-210 through a beta decay.

One of the most common places for polonium to concentrate in nature is in tobacco. As the radium in the soil decays, the electrically charged polonium ion adheres to dust particles that accumulate on the hairy underside of tobacco leaves. As the tobacco leaves are dried, the polonium becomes even more concentrated. When the tobacco is smoked the polonium is inhaled and is deposited in the lungs where it decays, emitting alpha particles causing damage to the lung tissue.

IS POLONIUM-210 HAZARDOUS?

Polonium is an alpha emitter. As an alpha emitter, it poses no external hazard but it does pose a hazard if ingested, inhaled, or if it enters the body through an opening in the skin. One milligram of Po-210 emits as many alphas as 5 grams of radium. Thus a very small quantity of Po-210 can be fatal if ingested. For example: a 200 pound person (about 90 kilograms) given about 0.9 micrograms (about 150 MegaBecquerels or 4 milliCuries) of Po-210 would have a median survival time of only 20 days.

Any polonium that is absorbed into the blood stream will be distributed throughout the soft tissues of the body (those tissues other than bones or teeth). The organs that concentrate most of the absorbed polonium are the spleen, kidneys, and liver (~45%) with somewhat less to the bone marrow (~10%). The remainder is distributed throughout the body, including the lymph nodes and on the mucous lining of the respiratory tract.

PROPERTIES OF POLONIUM-210 (^{210}Po)

Half-Life:

Physical: 138 days

Biological: Spleen – 60 days

Principal Modes of Decay: Alpha 5.3 MeV (100%)

Principal Target Organs: spleen, kidneys, liver

Amount of Element in Body: Trace

Sources

Jefferson Lab,
http://education.jlab.org/itselemental/ele084.html

Health Physics Society,
http://hps.org/documents/po210factsheet.pdf

Wikipedia,
http://wikipedia.org/wiki/Polonium

Links to external resources are provided as a public service and do not imply endorsement by the Washington State Department of Health.