

WARNING! PLUTONIUM RELEASED



What is it: Plutonium-239 is an isotope of Plutonium. An isotope is a variant of an element that has the same number of protons and neutrons of its original element but a different number of neutrons

Who discovered it: Glenn T. Seaborg and his fellow scientists including Joseph W. Kennedy, Edwin M. McMillan, and Arthur C. Wahl

Properties

- Atomic number is 94
- Protons and electrons numbers are 94
- Has 145 neutrons
- Half-life is 24,100 years
- Is a silver-grey metal that turns yellow when exposed to air

Uses: Is used mostly in nuclear powerplants and also in atomic bombs like the ones dropped on Japan in 1945

Decay

When Plutonium-239 decays, it becomes Uranium-235. This is an example of alpha decay. Alpha particles are not very dangerous when external, as they cannot pass through skin, but ingestion of alpha particles is very dangerous.

Health Effects

When Plutonium-239 is inhaled it will stay lodged in the body for decades and will expose your internal organs to radiation poisoning. This can do damage to the kidneys and increase risk of cancer in any part of the body where radiation spreads. While no documented human deaths have been contributed to a human death, it is possible that, if you inhale too much of it, it will kill you.

Using formulas

$$N = N_0 e^{-\lambda \frac{t}{t_{1/2}}}$$

N is the amount left after the decay

N_0 is the original amount of atoms

λ is the decay constant

T is the timespan of the decay

$t_{1/2}$ is the half-life of the element

Using the exponential decay formula, if 50 grams of Plutonium-239 is found in the soil, how much would be remaining after ten years? (decay constant is 0.000029)

The filled in equation is $N = 50e^{-0.000029 \frac{10}{24,100}}$ and the answer is 49.999 grams

Using the exponential decay formula, how many years would have to pass until there is a small enough amount of Plutonium-239 that it wouldn't affect the body (about 3 micrograms)?

$$0.000003 = 50e^{-0.000029 \frac{x}{24,100}}$$

$$X = 1.38 \times 10^{10} \text{ years}$$