

Plutonium (Pu-239)

Half Life: 24,110 years

Radiation: Alpha

Shielding: Alpha emitters can be very biologically effective internally but are hardly able to pass through a few centimeters of air outside the body.

Dosimetry: Body and ring badges

Detection/Measurement: GM tube with thin window. Wipe tests required.

General Precautions:

- Maintain your occupational exposure to radiation As Low As Reasonably Achievable [ALARA]
- All persons handling radioactive material must be properly trained by EHS prior to handling and are listed as a rad worker by EHS department
- Plan experiments accordingly to minimize external exposure by reducing exposure time, using shielding and increasing your distance from the radiation source
- Monitor yourself and the work area during and after each use of radioactive material
- Use the smallest amount of radioisotope possible to minimize radiation dose and radioactive waste
- Keep an accurate inventory of all radioactive material including records of all receipts, transfers and disposal – contact EHS for any disposal needs including liquid waste

- Perform and record lab surveys as needed (monthly and post experiment)
- Avoid generating mixed waste (combinations of radioactive, biological and chemical waste)

Special Precautions:

- The main threat to humans comes from inhalation. While it is very difficult to create airborne dispersion of a heavy metal like plutonium, certain forms, including the insoluble plutonium oxide at a particle size less than 10 microns are a hazard. If inhaled, much of the material is immediately exhaled or is expelled by mucous flow from the bronchial system into the gastro-intestinal tract, as with any particulate matter.
- Use tools to indirectly handle unshielded sources and potentially contaminated containers - no direct hand contact
- Ensure that an appropriate, operational survey meter is present in the work area and turned on whenever Pu-239 is handled to immediately detect contamination
- Shield waste containers as needed to maintain accessible dose rate ALARA

Safe Lab Practices:

- Disposable gloves, lab coats, and safety glasses are the minimum PPE required when handling radioactive material
- Remove and discard potentially contaminated PPE prior to leaving the lab area where radioactive material is used
- Cover all lab bench tops where radioactive material is handled with plastic-backed absorbent paper – change as needed
- Handle radioactive solutions in trays large enough to contain the material in the event of a spill
- Never eat, drink, smoke, handle contact lenses, apply cosmetics, or take medicine in the lab - keep food, drinks, and cosmetics out of the lab entirely
- Never pipette by mouth
- Never store food and beverages in refrigerators/freezers used for storing radioisotopes – ensure that isotopes are secured at all times
- Avoid any skin contact with skin-absorbable solvents containing radioactive materials

- **Fume hoods and biological safety cabinets for use with non-airborne radioactive material must work properly and be inspected annually by the EHS department**
- **Do not take any radioactive material off site or use in any ways not approved by the Radiation Safety Officer**