

^{109}Cd

Radioisotope Safety Data Sheet Cadmium 109

Half life 462.6 days

Radiations emitted

X-rays: 22 keV (83%) 25 keV (15%)
Gamma ray 88 keV (4%).

Safety precautions

^{109}Cd is a low energy X and gamma ray emitter that is only rarely used in unsealed form. With MBq amounts the primary hazard is internal. Because of the low dose rate constant there is only a limited potential for external exposure with amounts less than a few MBq. No workstation shielding is required with MBq quantities. Waste bins should be monitored to determine whether shielding is required. Handling tools and standard laboratory PPE (gloves, lab coat, safety glasses) should be used to avoid skin contamination.

Work areas and equipment should be monitored using a suitable survey meter

A fume cupboard should be used when handling volatile compounds or for processes that could produce aerosols.

Radiotoxicity data

^{109}Cd is classed as being of medium to high hazard (group 2) according to AS 2243.4

The Annual Limit on Intake by ingestion (ALI_{ing}) is 10 MBq and the most restrictive inhalation limit ($\text{ALI}_{\text{inhal}}$) is 2.1 MBq.

Dose rates

The dose rate constant is about 50 $\mu\text{Sv/hr/GBq}$ @ 1 m. This is somewhat less than that of ^{125}I and is regarded as low in comparison with most other gamma emitters.

Shielding

Substantial absorption of radiation is achieved with fairly thin lead sheets (~1 mm) although neither workstation nor waste bin shielding will be necessary with amounts less than a few MBq.

Licensing requirements

Under the Radiation Safety Regulation 2010, a licence is required for the possession of

^{109}Cd sources with concentrations of greater than 10 kBq per gram and with activities of 1 MBq or greater. A user licence is also required for any persons who use such sources for research purposes.

Disposal data

The maximum concentration of ^{109}Cd in aqueous wastes released to a sewerage system is given in the 2010 Regulation as 685 kBq per m^3 i.e. 685 Bq per litre.

The concentration of ^{109}Cd in solid wastes disposed of to either the general or pathology waste streams must be less than 5 kBq per gram (5 MBq per kg) – i.e. half the concentration limit for licensing. Retention of wastes for decay may not be feasible given the relatively long half-life. Consequently, users must aim to minimise solid wastes wherever possible.

Radiation detection and monitoring

A large diameter end window or pancake type GM tube contamination monitor is the most suitable type of meter for contamination control. For personal monitoring, TLD dosimeters are recommended (for details see the Personal Radiation Monitoring Safety Guideline).

Laboratory requirements

Low level lab guidance activities

Bench: 740 kBq
Fume cupboard: 7.4 MBq

Medium level lab guidance activities

Bench: 3.7 MBq
Fume cupboard: 37 MBq

NB: While AS 2243.4 sets greater activity limits, the guidance activities are maximum amounts that should need to be used in most research projects.