^{54}Mn

Radioisotope Safety Data Sheet
Manganese 54

Half life 312 days

Radiations emitted

Radiation	Energy, keV	Yield %
Kα1 X-ray	5.4	7.4
Kα2 X-ray	5.4	14.7
Kβ X-ray	6	3
Gamma ray	835	100
Auger electrons	5	64

Safety precautions

^{54}Mn is a high energy gamma ray emitter. It presents both an internal and external hazard.

Amounts of more than 3.7 MBq should only be manipulated behind lead bricks. A single thickness wall of two courses of 50 mm bricks should provide sufficient shielding while allowing good access.

Substantial shielding (such as 50 mm lead bricks) is also required for any quantity of wastes stored for decay in the laboratory.

Although the absence of beta radiation means that skin contact dose rates are relatively low, standard laboratory PPE (gloves, lab coat, safety glasses) should be used to minimise the risk of skin absorption.

Radiotoxicity data

The Annual Limit on Intake by ingestion (ALI_{ing}) is 28 MBq and the most restrictive inhalation limit $(ALI)_{inhal}$ is 13 MBq.

Shielding

Half value layer (HVL): 11 mm lead

Tenth value layer (TVL): 32 mm lead

Dose rates

The gamma ray dose rate constant is 130 µSv/h/ GBq @ 1 m

Dose rate to the basal skin cells from contamination of 1 kBq cm^{-2} 62 µSv h^{-1}

Dose rate from a 1 kBq (0.05 ml) droplet on skin: 15 µSv h^{-1}

Licensing requirements

Under the 2010 *Regulation*, a licence is required for the possession of ^{54}Mn sources with concentrations of greater than or equal to 10 Bq 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 ^{54}Mn in aqueous wastes released to a sewerage system is given in the 2010 Radiation Safety Regulation as 1.93 MBq per m^3 i.e. 1.93 kBq per litre.

The concentration of ^{54}Mn in solid wastes disposed of to either the general or pathology waste streams must be less than 5 Bq per gram (5 kBq per kg) – i.e. half the concentration limit for licensing.

The activity of stored wastes can easily be determined by measuring the radiation level with a survey meter scaled in µGy (or µSv) per hour and applying the dose rate constant.

Radiation detection and monitoring

Either a Geiger Muller tube or scintillation monitor is suitable for contamination control. For personal monitoring, TLD dosemeters are recommended for whole body monitoring. (For details see the Personal radiation monitoring Safety Guideline).

Laboratory requirements

Low level lab maximum activities

Bench: 2 MBq
Fume cupboard: 20 MBq

Medium level lab maximum activities

Bench: 5 MBq
Fume cupboard: 50 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.

Should greater activities need to be used, the advice of the University Radiation Protection Adviser should be sought.