

# <sup>54</sup>Mn

## Radioisotope Fact Sheet Manganese 54

**Half life** 312 days

### Radiations emitted

Radiation	Energy (keV)	Yield (%)
X-ray	5.4, 6	22, 3
Gamma ray	835	100
Auger electron	5	64

### Safety precautions

<sup>54</sup>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

<sup>54</sup>Mn is classed as being of high hazard (Group 2) according to AS/NZS 2243.4.

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 138  $\mu\text{Sv/h/GBq}$  at 1 m

Dose rate to the basal skin cells from contamination of 1  $\text{kBq cm}^{-2}$ : 62  $\mu\text{Sv h}^{-1}$

Dose rate from a 1  $\text{kBq}$  (0.05 ml) droplet on skin: 15  $\mu\text{Sv h}^{-1}$

### Licensing requirements

Under the Radiation Safety *Regulation 2021*, a licence is required for the possession of <sup>54</sup>Mn sources with concentrations of greater than or equal to 10 Bq per gram and with activities of 1 MBq or greater. A use licence is also required for any persons who use such sources for research purposes.

### Disposal data

The maximum concentration of <sup>54</sup>Mn in aqueous wastes released to a sewerage system is given in the *Regulation* as 1.93 MBq per  $\text{m}^3$  i.e. 1.93 kBq per litre.

The concentration of <sup>54</sup>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.

### Radiation detection and monitoring

Either a Geiger Muller tube or scintillation monitor is suitable for contamination control. For personal monitoring, TLD/OSL dosimeters are recommended for whole body monitoring.

### Laboratory requirements

Indicative maximum activities:

Low level	Bench	2 MBq
	Fume cupboard	20 MBq
Medium level	Bench	5 MBq
	Fume cupboard	50 MBq