

**<sup>59</sup>Fe**

# Radioisotope Safety Data Sheet

## Iron 59

**Half life** 44.5 days

### Radiations emitted

Beta rays      273 keV max, 81 keV average  
yield 45.2%  
466 keV max, 149 keV average,  
yield 53.1%

Gamma rays    1.099 MeV yield 56.5%  
1.292 MeV yield 43.2%

### Safety precautions

<sup>59</sup>Fe is a high energy gamma emitter and a medium energy beta emitter. It presents both an internal and external hazard.

Handling tools and standard laboratory PPE (gloves, lab coat, safety glasses) should be used to minimise exposure.

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 required for any quantity of wastes stored for decay in the laboratory.

NB radiation levels in controlled areas must not exceed 40 µSv per week, and in areas accessible to non-radiation workers, 10 µSv per week.

### Radiotoxicity data

<sup>59</sup>Fe is classed as being of moderate hazard (group 3a) according to AS 2243.4.

The Annual Limit on Intake by ingestion (ALI<sub>ing</sub>) is 11 MBq and the most restrictive inhalation limit (ALI)<sub>inhal</sub> is 5.7 MBq.

### Dose rates

The gamma ray dose rate constant is 160 µSv/h/ GBq @ 1 m

Dose rate to the basal skin cells from contamination of 1 kBq cm<sup>-2</sup> 973 µSv h<sup>-1</sup>

Dose rate from a 1 kBq (0.05 ml) droplet on skin: 300 µSv h<sup>-1</sup>

### Shielding

Total absorption of beta radiation: 1.2 mm perspex

Half value layer (HVL) for X and gamma rays 15 mm lead

Tenth value layer (TVL) for X and gamma rays 45 mm lead

### Licensing requirements

Under the *Radiation Safety Regulation 2010*, a licence is required for the possession of <sup>59</sup>Fe 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 <sup>59</sup>Fe in aqueous wastes released to a sewerage system is given in the 2010 Radiation Safety Regulation as 761 kBq per m<sup>3</sup> i.e. 761 Bq per litre.

The concentration of <sup>59</sup>Fe 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 dosimeters are recommended for both whole body and extremity monitoring. (For details see the Personal radiation monitoring Safety Guideline).

#### Laboratory requirements

##### Low level lab maximum activities

Bench: 740 kBq  
Fume cupboard: 7.4 MBq

##### Medium level lab maximum activities

Bench: 3.7 MBq  
Fume cupboard: 37 MBq