

14C

Radioisotope Safety Data Sheet Carbon 14

Half life 5730 years

Radiations emitted

Beta radiation only: 157 keV max, 50 keV average, 100% yield.

Safety precautions

¹⁴C is a low energy beta emitter that only presents an internal hazard. Perspex shielded workstations are not required because of the limited range of the beta rays in air. 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 must be used for ¹⁴CO₂ labelling or carrying out any processes that could liberate ¹⁴CO₂ or ¹⁴CO.

Radiotoxicity data

¹⁴C is classed as being of low hazard (group 4) according to AS 2243.4.

The Annual Limit on Intake by ingestion (ALL_{ing}) or inhalation (ALL_{inhal}) is 34 MBq.

Dose rates

Beta dose rate to the basal skin cells from contamination of 1 kBq cm⁻² 324 μSv h⁻¹

Beta dose rate from a 1 kBq (0.05 ml) droplet on skin: 2.7 μSv h⁻¹

Shielding

Maximum range in air: 27 cm. There is very low potential for bremsstrahlung production and perspex shielding of workstations and waste containers is not necessary.

Licensing requirements

Under the *Radiation Safety Regulation 2010*, a licence is required for the possession of ¹⁴C sources with concentrations of greater than or equal to 10 kBq per gram and with activities of 10 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 ¹⁴C in aqueous wastes released to a sewerage system is given in the 2010 Regulation as 2.36 MBq per m³ i.e. 2.36 kBq per litre.

The concentration of ¹⁴C 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.

Wastes containing ¹⁴C should not be placed in a decay store as there will be no significant diminution in activity and accountability for the waste may be lost.

Where licensed users create wastes containing ¹⁴C they should consult with the practice RSO to determine the most appropriate method for the waste to be disposed of promptly.

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. TLD personal dosimeters are barely capable of responding to ¹⁴C beta radiation and are not mandatory (for details see the Personal Radiation Monitoring Safety Guideline).

Laboratory requirements

Low level lab guidance activities

Bench: 10 MBq (No ¹⁴CO₂ use)
Fume cupboard: 100 MBq (1 MBq for ¹⁴CO₂)

Medium level lab guidance activities

Bench: 37 MBq (No ¹⁴CO₂ use)
Fume cupboard: 370 MBq (37 MBq for ¹⁴CO₂)

NB: the guidance activities are maximum amounts that should need to be used in most research projects. The advice of the University Radiation Protection Adviser should be sought regarding the use of greater activities.