

^{22}Na

Radioisotope Safety Data Sheet Sodium 22

Half life 2.6 years

Radiations emitted

Positrons: 545 keV max (215 keV avg)
89.8 % yield

Gamma rays 1274.5 keV (99.94% yield);

Annihilation radiation 511 keV (yield 179.9%)

Safety precautions

^{22}Na is a high energy gamma emitter as well as being a positron emitter. Positrons are anti-electrons and their interaction with electrons found in normal matter results in mutual annihilation and conversion of their mass to energy emitted as 2 photons of 511 keV each.

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.

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

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

Radiotoxicity data

^{22}Na is classed as being of moderate hazard (group 3a) according to AS 2243.4.

The Annual Limit on Intake by ingestion (ALI_{ing}) is 11 MBq and the most restrictive inhalation limit ($\text{ALI}_{\text{inhal}}$) is 5.7 MBq.

Dose rates

The gamma ray dose rate constant is 160 $\mu\text{Sv/h/GBq}$ @ 1 m

Dose rate to the basal skin cells from contamination of 1 kBq cm^{-2} 973 $\mu\text{Sv h}^{-1}$

Dose rate from a 1 kBq (0.05 ml) droplet on skin: 300 $\mu\text{Sv h}^{-1}$

Shielding

NB perspex shielding used for ^{32}P work offers no protection with ^{22}Na ; the absorption

of positrons always produces annihilation radiation.

Half value layer (HVL) for gamma rays and 511 keV annihilation radiation: 10 mm lead

Tenth value layer (TVL) for gamma rays and 511 keV annihilation radiation: 37 mm lead

Licensing requirements

Under the *Radiation Safety Regulation 2010*, a licence is required for the possession of ^{22}Na 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 ^{22}Na in aqueous wastes released to a sewerage system is given in the 2010 Radiation Safety Regulation as 761 kBq per m^3 i.e. 761 Bq per litre.

The concentration of ^{22}Na 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