

238U

Radioisotope Fact Sheet Uranium chemicals

Half life 4.5×10^9 years

Radiations emitted

Uranium chemicals sold for laboratory use are a mixture of the isotopes ^{238}U , ^{234}Th and $^{234\text{m}}\text{Pa}$, with a small amount of ^{235}U and ^{234}U . These isotopes are alpha and beta emitters that present essentially an internal hazard.

alpha radiation from ^{238}U and ^{234}U (energies from 4.15 to 4.77 MeV)

beta radiation from ^{234}Th and $^{234\text{m}}\text{Pa}$ (energies from 76 keV to 2.28 MeV)

Low yield **gamma radiation** from ^{234}Pa

Safety precautions

Safety measures should aim at preventing ingestion, inhalation or skin contact. Standard laboratory PPE should always be used. A fume cupboard should be used for processes that could produce an inhalation hazard, e.g. mixing of dry chemicals. Work areas and equipment should be monitored using a suitable survey meter. Because of the very low specific activity and low gamma ray yield, there are no significant external hazards. There is no requirement for shielding when using or storing commercially available quantities of uranium chemicals.

Radiotoxicity data

Since uranium chemicals contain alpha emitters they present significant internal hazards and this is reflected in the low annual limits on intake.

The Annual Limit on Intake by ingestion (ALI_{ing}) is 450 kBq and the most restrictive inhalation limit ($\text{ALI}_{\text{inhal}}$) is 2.7 kBq. The chemical toxicity effects are more significant than the radiological ones and consist chiefly of damage to the kidneys (nephrotoxicity) and the production of necrotic arterial lesions.

Licensing requirements

Under the *Radiation Safety Regulation 2021*, a licence is required for the possession of ^{238}U sources with concentrations of greater than or equal to 1 Bq per gram and with activities of 1 kBq or greater. A use licence is

also required for any persons who use such sources for research purposes.

Disposal data

The maximum concentration of uranium in aqueous wastes released to a sewerage system is given in the *Regulation* as 3.11 kBq per m^3 i.e. 3.11 Bq per litre.

The concentration of uranium in solid wastes disposed of to the general waste stream must be less than 0.5 Bq per gram (500 Bq per kg) – i.e. half the concentration limit for licensing.

Wastes containing uranium 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. Users should consult with the RSO to determine the most appropriate method of waste disposal.

Radiation detection and monitoring

A Geiger Muller tube monitor is the most suitable type of meter for contamination control. Personal monitoring is not required.

Laboratory requirements

Indicative maximum activities:

Low level	Bench	500 kBq
	Fume cupboard	5 MBq
Medium level	Bench	1 MBq
	Fume cupboard	10 MBq