

Disposal of radioactive waste

Open radioactive sources must be handled in accordance with the "Waste Regulations", and disposed of according to the activity level and half-life of the nuclides used. It is not allowed to dilute the waste before discarding the waste.

The user is responsible for ensuring that the waste is handled properly and properly according to the radiation level of the waste.

Waste that can reach background level of radiation by decay:

This is radioactive waste that can achieve background radiation within one (1) year.

Waste from radioactive nuclides must be packed in yellow waste containers, one container for each nuclide.

To calculate the required storage time, the equation below can be used (formula 1)

$$t = \ln(A/A_0) / -[\ln(2)/t_{1/2}]$$

- t = required storage time (number of days)
- A = Specific activity at time t (ie limit value for nuclide according to regulations on radioactive contamination and waste, see Table 1)
- A_0 = specific activity in the waste at $t = 0$ (Bq / g at time $t = 0$, ie activity by purchasing divided by the amount of waste at $t = 0$)
- $t_{1/2}$ = nuclide half-life (see Table 1)

If the activity after the required storage time is below the specific activity for radioactive waste given in "Regulations on the use of radioactive contamination and waste" (Annex I and Table 1), and the time is shorter than one year, the waste can be disposed of as problematic waste / hazardous waste.

If the required storage time is more than one year, the waste must be sent as radioactive waste to the Institute of Energy Technology (IFE). Use black waste containers. Contact the local radiation protection coordinator before sending the IFE.

Based on calculations of required storage time (Table 2), at UiB it will be possible to allow F-18, P-32 and I-124 to decay in order to be disposed of as problematic waste / hazardous waste.

Table 1: Overview of nuclides, half-life ($t_{1/2}$) and limit values (A).

Nuclide	Half-life ($t_{1/2}$)	A (limit value according legislation) (Bq/g)
^3H	12,3 year	100
^{14}C	5730 year	10
^{18}F	1,8 hours	10
^{22}Na	2,6 year	0,1
^{32}P	14,3 days	1000
^{33}P	25,6 days	1000
^{35}S	87,5 days	100
^{51}Cr	27,7 days	100
^{124}I	4,2 days	10
^{125}I	60,1 days	100

Table 2. Calculation of required storage time.

The amount of waste is set to 1 g (which is about weight on the purchased isotope at $t = 0$). A_0 is set to 37 MBq which will be a typical activity used by UiB. Half-life ($t_{1/2}$) and Specific activity (A) are fixed for each nuclide.

Nuclide	A (specific activity at time t) (Bq/g)	A_0 (specific activity i waste at t=0)	$t_{1/2}$ (half life time)	t (required storage time)
^{18}F	10	37	1,8 hours	1,64 days
^{32}P	1000	37	14,3 days	216 days
^{33}P	1000	37	25,6 days	388 days
^{35}S	100	37	87,5 days	1027,5 days
^{51}Cr	100	37	27,7 days	512 days
^{124}I	10	37	4,2 days	91,7 days