Stanford | Environmental Health & Safety

RADIONUCLIDE SAFETY DATA SHEET

RADIONUCLIDE: Gd-153

FORMS: Soluble

PHYSICAL CHARACTERISTICS

HALF-LIFE: 240.4 days

DECAY EMISSIONS

Gammas / X-rays		Betas / Positrons (+) / Electrons*		Alphas	
E (keV)	%	E (keV, Ave)	%	E (keV)	%
42	63	55*	31		
41	35	21*	11		
97	29	49*	7		
103	21	34*	6		

- Only 4 most probable emissions per decay type included. Emissions below 10 keV or 1% excluded.

STANFORD HAZARD CATEGORY

C – level (low hazard): **≤ 2 mCi**
B – level (moderate hazard): **> 2 mCi, ≤ 100 mCi**
A – level (high hazard): **> 100 mCi**

EXTERNAL RADIATION HAZARDS

Gamma dose rate, point source at 1 ft, 1 mCi:
0.8 mrem/h

Beta dose rate to skin, point source at 1 ft, 1 mCi:
~ 0 mrem/h

Contamination skin dose, uniform deposit of 1 µCi per cm^2:
~ 2000 mrem/h (estimate from Cd-109 data)

INTERNAL RADIATION HAZARDS

Annual Limit on Intake: **5000 µCi** (Ingestion)
100 µCi (Inhalation)

The values above indicate the activity taken into the body that would result in either 5 rem to the whole body (CEDE) or 50 rem to an organ or tissue (CDE).

SHIELDING

Gammas/X-rays:
<1 mm of lead will reduce the gamma dose rate by 90%.

Betas/electrons:
< 1 mm of plastic will absorb all emissions.

DOSIMETRY AND BIOASSAY REQS

Urine assays may be required after large spills or contaminations.

SPECIAL PROBLEMS AND PRECAUTIONS:

1. Recommended survey probe: **Thin-window NaI**
2. Always wear protective gloves, a lab coat, and safety eyewear to protect the skin and eyes from contamination. Change gloves often.
3. Survey work areas before, during, and after work. Instrument and smear surveys are required.
4. Segregate waste to those with half-lives greater than **120 days (excluding H3 and C14)**.
5. Limit soluble waste to the sewer to less than **10** µCi/day per lab.

References:

- Delacroix, D., Guerre, J.P., Leblanc, P., Hickman, C. (2002). Radionuclide and Radiation Protection Data Handbook (2nd ed.). Ashford, Kent: Nuclear Technology Publishing.
- Johnson, T.E., Birky, B.K. (2012). Health Physics and Radiological Health (4th ed.). Baltimore, MD: Lippincott Williams & Wilkins.
- ICRP, 2008. Nuclear Decay Data for Dosimetric Calculations. ICRP Publication 107. Ann. ICRP 38 (3).
- Peplow, D. (2020) Specific Gamma-Ray Dose Constants with Current Emission Data. *Health Physics,* 118(4):402-416; 2020.
- Smith, D., Stabin, M. (2012) Exposure Rate Constants and Lead Shielding Values for Over 1,100 Radionuclides. *Health Physics,* 102(3): 271-291.
- 10.CFR.20 – Standards for Protection Against Radiation (2019). Retrieved from https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/

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