



National Institute of Standards & Technology

Certificate

Standard Reference Material 4369 Radioactivity Standard

Radionuclide	Gadolinium-153
Source identification	SRM 4369
Source description	Solution in 5-mL flame-sealed borosilicate-glass ampoule ^{(1)*}
Chemical form	Approximately 248 μg of Gd, as GdCl_3 , in 1M HCl ⁽²⁾
Mass	grams
Radioactivity concentration	$1.253 \times 10^6 \text{ Bq g}^{-1}$ ⁽³⁾
Reference time	1200 EST June 1, 1989
Overall uncertainty	1.90 percent ⁽⁴⁾
Photon-emitting impurities	$^{152}\text{Eu}/^{153}\text{Gd}: (5.4 \pm 4.3) \times 10^{-7}$ ⁽⁵⁾ $^{154}\text{Eu}/^{153}\text{Gd}: (5.3 \pm 4.2) \times 10^{-7}$
Half life	239.5 ± 0.2 days ⁽⁶⁾
Measuring instrument	NIST $4\pi(e^-,x)-\gamma$ anti-coincidence counting system

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
June, 1989

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

*Notes on back

NOTES

- (1) The sample contains approximately five milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

- (2) Solution density 1.014 ± 0.002 g/mL at 24.7° C.
- (3) Preliminary NIST gamma-ray spectrometry measurements of sources of known activity indicate a gamma-ray probability per decay of 0.303 ± 0.004 for the 97.4-keV transition and of 0.225 ± 0.003 for the 103.2-keV transition.
- (4) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) dilutions	0.1	percent
b) 4π(e ⁻ ,x)-γ anti-coincidence measurements	0.1	percent
c) gravimetric measurements	0.2	percent
d) decay correction	0.001	percent
e) background	0.3	percent
f) extrapolation	0.5	percent
g) impurities	0.0003	percent
h) dead time	0.02	percent
i) half life correction	0.03	percent

- (5) Limits of detection as a percentage of the gamma-ray-emission rate of 97.4 keV gamma rays emitted in the decay of gadolinium-153 are:

0.1 percent between 20 and 95 keV
0.01 percent between 108 and 1900 keV,

provided that impurity photons are separated in energy by 5 keV or more from photons emitted in the decay of ¹⁵³Gd.

- (6) Half life measured at NIST.

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