National Institute of Standards & Technology

Certificate

Standard Reference Material 4222C

Radioactivity Standard for Liquid Scintillation Counting

Radionuclide	Carbon-14-n-hexadecane
Source identification	4222C
Source description	5-ml of solution in NIST borosilicate-glass ampoule (1)*
Solution composition	^{14}C-labeled n-hexa n-hexadecane (2)
Radioactivity concentration	5.402×10^4 Bq g^{-1}
Reference time	1200 EST September 3, 1990
Overall uncertainty	0.81 percent (3)
Photon-emitting impurities	None observed (4)
Measuring instrument	Liquid-scintillation counter (5)
Half life	5760 ± 50 years (6)

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

Gaithersburg, MD 20899
January, 1991

William P. Reed, Acting Chief
Office of Standard Reference Materials

*Notes on back

NOTES

1) 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) The density of n-hexadecane is 0.7709 ± 0.001 g/cm^3 at 25.0 °C.

3) 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) liquid-scintillation measurements for 11 vials times 5 runs	0.03 percent
b) standardization utilizing efficiency tracing technique [5]	0.20 percent
c) gravimetric measurements	0.15 percent
d) quenching in the liquid scintillator	0.10 percent

4) Limits of detection for photon-emitting impurities are:

0.02 γs^{-1} between 100 and 1900 keV.

5) The liquid-scintillation counter was standardized using a ^{3}H radioactivity standard, by comparing the theoretical and observed spectra for ^{14}C and ^{3}H, as described in Coursey, B.M., et al. Appl. Radiat. Isot., 37, 405 (1986).

6) Mann, W.B., Marlow, W.F., and Hughes, E.E., Int. J. Appl. Radiat. Isot. 11, 57 (1961).

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