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-hexadecane in inactive 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 Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
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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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