Department of Commerce
Malcolm Baldrige
Secretary
National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate

Standard Reference Material 4222-B

Radioactivity Standard

Carbon-14-n-Hexadecane for Liquid Scintillation Counting

Source identification	4222-B
Source description	5-ml of solution in NBS borosilicate-glass ampoule (1)*
Solution composition	^{14}C-labeled n-hexadecane in inactive n-hexadecane (2)
Radioactivity concentration	4.900×10^4 Bq g^{-1}
Reference time	July, 1983
Random uncertainty	0.14 percent (3)
Systematic uncertainty	1.20 percent (4)
Total uncertainty (Random plus systematic)	1.34 percent
Photon-emitting impurities	None observed (5)
Measuring instrument	Liquid-scintillation counter (6)
Half life	5760 ± 50 years (7)

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Washington, D.C. 20234
August 1983

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

*Notes on back

FOOTNOTES

(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 ± 0.0010 g/cm^3 at 25.0°C.

(3) The 99-percent confidence interval of the mean (3.250 times the standard deviation of the mean of 10 liquid-scintillation measurements).

(4) Linear sum of estimated uncertainty limits due to:

a) standardization of ^{14}C working standard (6)	0.8 percent
b) gravimetric measurements	0.3 percent
c) quenching in the liquid scintillator	0.1 percent

(5) Limits of detection for photon-emitting impurities are:

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

(6) The liquid-scintillation counter was standardized using a ^3H radioactivity standard, by comparing the theoretical and observed spectra for ^{14}C and ^3H. The activity concentration of the working standard of ^{14}C standardized by this technique agrees with those obtained by gas counting (to within 0.2 percent) and $4\pi\beta(LS)-\gamma$ anti-coincidence efficiency tracing with ^{60}Co (to within 0.5 percent).

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

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