



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	$4.900 \times 10^4 \text{ Bq g}^{-1}$
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	$5760 \pm 50 \text{ years}$ (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
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Stanley D. Rasberry, Chief
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*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/cm³ 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 γ s⁻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 ¹⁴C and ³H. The activity concentration of the working standard of ¹⁴C standardized by this technique agrees with those obtained by gas counting (to within 0.2 percent) and 4 π β (LS)- γ anti-coincidence efficiency tracing with ⁶⁰Co (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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