



National Institute of Standards & Technology

Certificate

Standard Reference Material 4406L-M Radioactivity Standard

Radionuclide	Phosphorus-32
Source identification	4406L-M-
Source description	Liquid in NIST borosilicate-glass ampoule ^{(1)*}
Solution composition	Approximately 0.001 molar H ₃ PO ₄ ⁽²⁾
Mass	
Phosphorus-32 radioactivity concentration	2.643 x 10 ⁶ Bq g ⁻¹ ⁽³⁾
Reference time	1200 EST October 29, 1992
Overall uncertainty	1.03 percent ⁽⁴⁾
Photon-emitting impurities	None observed ⁽⁵⁾
Half life	14.29 ± 0.02 days ⁽⁶⁾
Measuring instrument	NIST 4πβ liquid-scintillation counter

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M. Robin Hutchinson, Acting Group Leader.

Gaithersburg, MD 20899
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*Notes on back

NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:
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|----------------------|------------------------|
| 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 0.998 ± 0.002 g/mL at 23.1 °C.
- (3) It has been determined that phosphorus-33 is present in the phosphorus-32. At the time of calibration, the ratio of the radioactivity concentration of the phosphorus-33 to that of the phosphorus-32 was 0.0079 ± 0.0032 . Assessment of the amount of phosphorus-33 present was made by fitting data obtained by liquid-scintillation counting over a 72-day period.
- (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:
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|---|--------------|
| a) 15 liquid-scintillation measurements | 0.01 percent |
| b) ^3H reference beta-particle standard | 0.05 percent |
| c) quenching in the liquid-scintillation measurements | 0.10 percent |
| d) source preparation | 0.10 percent |
| e) dead-time correction | 0.05 percent |
| f) scintillator stability | 0.05 percent |
| g) ^{33}P impurity | 0.30 percent |
- (5) Limits of detection are:
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|--|
| $3 \text{ } \mu\text{s}^{-1} \text{ g}^{-1}$ between 100 and 400 keV |
| $0.6 \text{ } \mu\text{s}^{-1} \text{ g}^{-1}$ between 400 and 1900 keV. |
- (6) NCRP Report No. 58, 2nd edition, February 1985, p. 372.