

National Bureau of Standards Certificate

Standard Reference Material 4330

Plutonium-239 Alpha-Particle Solution Standard

This Standard Reference Material consists of approximately 2 milliliters of a solution of plutonium-239 in approximately 5N HNO₃ contained in a flame-sealed, borosilicate-glass ampoule.

The total number of alpha particles emitted by plutonium-239 plus impurities, including plutonium-240, per second per gram of solution in March 1975, was

$$*56.16 \pm 0.9\%*$$

This standard was taken from a master solution that was calibrated by liquid-scintillation counting. Confirmatory measurements were made using the NBS "0.8 π " defined-solid-angle alpha-particle counter with scintillator detector.

The uncertainty in the alpha-particle emission rate, 0.9 percent, is the linear sum of 0.1 percent, which is the limit of the random error of the liquid-scintillation counter measurements, at the 99-percent confidence level ($2.6 S_m$, where S_m is the standard error computed from 124 determinations), and 0.8 percent, which is the estimated upper limit of conceivable systematic errors.

The alpha-particle spectrum of a source prepared from this material was examined with a silicon surface-barrier detector. The total contribution from alpha particles with energies corresponding to ^{242}Pu and ^{241}Am was approximately 4×10^{-3} percent.

No attempt has been made to estimate the impurity level of ^{240}Pu , which has alpha particles with energies overlapping those of the alpha particles from ^{239}Pu . Mass spectroscopic data provided by the supplier, however, indicated that the $^{240}\text{Pu}/^{239}\text{Pu}$ activity ratio is of the order of 0.005.

This standard was prepared in the NBS Center for Radiation Research, Radioactivity Section, W. B. Mann, Chief

Washington, D.C. 20234
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Office of Standard Reference Materials

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