

National Bureau of Standards

Certificate

Standard Reference Material 4232

Radioactivity Standard

Silver-110m-Silver-110

This Standard Reference Material consists of silver-110m-silver-110 and carrier in (5.1095 ± 0.0075) grams of solution in a flame-sealed borosilicate glass ampoule. This solution contains approximately 0.4mg of silver per ml of approximately 1 N HNO_3 .

Thirty-five ampoules were prepared: each was measured in the NBS "4 π " γ ionization chamber; the solution in twenty of the ampoules was weighed. The average weight of solution in the thirty-five ampoules, 5.1095 grams, was interpolated from the average weight of solution in the twenty weighed ampoules and the ionization-chamber measurements of the thirty-five ampoules, assuming a proportional relationship between weight of solution and ionization-chamber response. The uncertainty, 0.0075 gram is half the range of the ionization-chamber measurements.

The activity of the silver-110m in nuclear transformations per second per gram of solution as of 1200 EST June 4, 1974, was

$$*1.69_9 \times 10^5 \pm 0.7_0\%*$$

The solution from which this Standard Reference Material was prepared was calibrated by 4 $\pi\beta$ - γ efficiency extrapolation coincidence counting, a correction being made for an extra contribution from the subsequent decay of the 25-second silver-110 ground state, assuming that this decay represents (1.4 ± 0.13) percent of that of silver-110m.

The uncertainty in the value, 0.7₀ percent, is the linear sum of 0.14 percent, which is the limit of the random error at the 99-percent confidence level $(2.64 S_m)$, where S_m is the standard error calculated from 162 points), and the upper limit of conceivable systematic error in the measurements and in the decay-scheme correction made.

The solution from which this Standard Reference Material was prepared was examined for impurities with a Ge(Li)-spectrometer and no gamma-ray impurities were observed. The limit of the gamma-ray-emission rate at any given energy due to impurities is estimated to be less than 0.1 percent of the 658 keV gamma-ray-emission rate of silver-110m.

Washington, D. C. 20234
September, 1974

J. Paul Cali, Chief
Office of Standard Reference Materials

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A half life of (250.07 ± 0.19) days is suggested. This value is the result of a least-squares fit of 52 sets of " ^{40}K " γ ionization-chamber measurements made over a period of 658 days on the material from which this Standard Reference Material was prepared. The uncertainty, 0.19 day, is the limit of the random error at the 99-percent confidence level ($2.7 S_m$, where S_m is the standard error).

This Standard Reference Material was prepared and calibrated in the National Bureau of Standards Center for Radiation Research, Radioactivity Section, W. B. Mann, Chief.