

National Bureau of Standards

Certificate

Standard Reference Material 4422L

Radioactivity Standard

Chlorine-36

This Standard Reference Material consists of chlorine-36 in _____ grams of approximately 1.52 M hydrochloric acid in a flame-sealed borosilicate-glass ampoule. The density of this solution is 1.024 ± 0.002 g/ml at 24.4°C.

The beta-ray-emission rate of the chlorine-36 in β^- per second per gram of solution, in 1980, is

$$*4.146 \times 10^5 \pm 1.58%*$$

The beta-ray-emission rate of this Standard Reference Material was determined by comparative liquid-scintillation-counting measurements of dilutions of the master solution and Standard Reference Material 4943, chlorine-36 as sodium chloride. The standard, SRM 4943, had been calibrated by $4\pi\beta$ proportional counting.

The uncertainty in the beta-ray-emission rate of this Standard Reference Material, 1.58 percent, is the linear sum of 0.07 percent, half the 99-percent confidence interval of the mean for the comparative liquid-scintillation-counting measurements (4.604 times the standard error computed from five independent comparisons), and 1.51 percent, the overall uncertainty ascribed to SRM 4943. The overall uncertainty associated with the calibration of SRM 4943, 1.51 percent, is the linear sum of the following: half the 99-percent confidence interval of the mean for the $4\pi\beta$ measurements, 0.41 percent; background, 0.1 percent; dead time, 0.1 percent; stability, 0.2 percent; self absorption, 0.2 percent; film absorption, 0.1 percent; solution density, 0.1 percent; effect of any impurities, 0.1 percent; plateau, 0.2 percent.

The solution from which this Standard Reference Material was prepared was examined for photon-emitting impurities with a germanium-spectrometer system and cobalt-60 was found to be present. At 1444 EST February 5, 1980, the ratio of the beta-ray-emission rate of cobalt-60 to that of chlorine-36 was $2.2 \times 10^{-7} \pm 1.1 \times 10^{-7}$. Photons at any energy between 90 and 1900 keV with an emission rate greater than 10^{-4} that of the beta-ray-emission rate of the chlorine-36 should have been detected.

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, W.B. Mann, Principal Scientist.

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