U.S. Department of Commerce
Elliot L. Richardson,
Secretary
nal Bureau of Standards
Ambler, Acting Director

National Bureau of Standards Certificate

Standard Reference Material 4413H

Radioactivity Standard

Mercury-197

This Standard Reference Material consists of mercury-197 in grams of carrier solution in a flame-sealed borosilicate glass ampoule. The solution, which contains approximately 2 milligrams of mercuric nitrate per gram of approximately 0.1 molar nitric acid, has a density of 1.002 ± 0.002 grams per milliliter at 21.7°C.

The radioactive concentration of the mercury-197 as of 0400 EST May 5, 1976, was

$$*6.8_3 \times 10^8 \pm 3.1_1\ \%\ s^{-1}g^{-1}*.$$

This Standard Reference Material was measured, relative to a radium-226 reference source, in the National Bureau of Standards "4π"γ pressure ionization chamber which had previously been calibrated, in terms of a radium-226 reference source, with mercury-197 solutions from which quantitative sources had been prepared and x_K - γ coincidence counted.

The solution from which this standard Reference Material was prepared was examined for photon-emitting impurities with a Ge(Li) spectrometer system and both mercury-197m and mercury-203 were found to be present. As of the certification date, the ratios of the activities of mercury-197m and mercury-203 to mercury-197 were 0.015 ± 0.005 and 0.00005 ± 0.00001, respectively. Any other radionuclide emitting a photon with energy less than 191 keV and having an emission rate greater than 10^{-3} that of the 191-keV gamma ray of mercury-197 would have been detected; the corresponding limit for any gamma ray with energy greater than 191 keV is 10^{-4}.

The uncertainty in the radioactive concentration of the mercury-197, 3.1_1 percent, is the linear sum of 0.06 percent, which is the limit of the random error at the 99-percent confidence level (2.977 S_m where S_m is the standard error computed from independent measurements of 15 samples) and 3.0_5 percent, which is the estimated upper limit of conceivable systematic errors including the assessment and correction for impurities.

This Standard Reference Material was prepared in the Center for Radiation Research, Radioactivity Section, W. B. Mann, Chief.

J. Paul Cali, Chief
Office of Standard Reference Materials

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