U.S. Department of Commerce
Juanita M. Kreps
Secretary

ıal Bureau of Standards
.iest Ambler, Director

National Bureau of Standards Certificate

Standard Reference Material 4411L-B

Radioactivity Standard

Iron-59

This Standard Reference Material consists of iron-59 in grams of carrier solution in a flame-sealed borosilicate-glass ampoule. The solution contains approximately 9 micrograms of iron per gram of approximately 1 molar hydrochloric acid, and has a density of 1.015 ± 0.002 grams per milliliter at 25°C.

The radioactivity concentration of the iron-59 at 1000 EST January 25, 1979, was

$$*7.686 \times 10^{5}\ s^{-1}g^{-1} \pm 1.54\%*.$$

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 iron-59 solutions from which quantitative sources had been prepared and $4\pi\beta$-γ coincidence counted using the efficiency-extrapolation method.

The material from which this Standard Reference Material was prepared was examined for photon-emitting impurities, and specifically for iron-55, with germanium-spectrometer systems and none was observed. If iron-55 had been present on January 25, 1979 at 1000 EST, the ratio of its activity to that of the iron-59 would have been less than 1.7×10^{-5}. The detection limits for other impurity photons may be expressed as a percentage of the gamma-ray-emission rate of the 1291.6-keV gamma ray emitted in the decay of iron-59. These limits are approximately 0.1 percent for gamma rays with energies less than 1287 keV, and 0.01 percent for those with energies greater than 1297 keV, provided that they are separated in energy by 5 keV or more from photons emitted in the decay of iron-59.

The uncertainty in the radioactivity concentration, 1.54 percent, is the linear sum of 0.04 percent, which is the limit of the random error at the 99-percent confidence level (2.861 S_m, where S_m is the standard error of the mean computed from independent measurements of 20 samples) and 1.50 percent, which is the estimated upper limit of conceivable systematic error.

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

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George A. Uriano, Acting Chief
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