

# National Bureau of Standards

## Certificate

### Standard Reference Material 4249

#### Radioactivity Standard

#### Barium-Lanthanum-140

This Standard Reference Material consists of barium-140 in equilibrium with lanthanum-140 in \_\_\_\_\_ grams of carrier solution in a flame-sealed borosilicate-glass ampoule. The solution, which contains 22ppm Ba and 22ppm La in approximately 1 M HCl, has a density of  $1.015 \pm 0.002$  g/ml at 24°C.

The radioactivity concentration of the barium-lanthanum-140 as of 1200 EST November 8, 1977, was

$$*2.138 \times 10^6 \text{ s}^{-1}\text{g}^{-1} \pm 3.40\%*$$

This Standard Reference Material was measured, relative to a radium-226 reference source, in the National Bureau of Standards "4 $\pi$ " $\gamma$  pressure ionization chamber which had previously been calibrated, in terms of a radium reference source, with barium-lanthanum-140 solutions from which quantitative sources had been prepared and 4 $\pi$  $\beta$ - $\gamma$  coincidence counted using the efficiency extrapolation method.

The solution from which this Standard Reference Material was prepared was examined for photon-emitting impurities with germanium-spectrometer systems and niobium-95 was found to be present. As of the certification time, the ratio of the activity of niobium-95 to barium-lanthanum-140 was  $0.0035 \pm 25\%$ . The detection limits for impurity gamma rays may be expressed as a percentage of the gamma-ray-emission rate of the 1596-keV gamma ray of lanthanum-140. These limits are approximately 0.1 percent for gamma rays with energies less than 1596 keV, and 0.01 percent for those of greater energy.

The uncertainty in the radioactivity concentration of the barium-lanthanum-140, 3.40 percent, is the linear sum of 0.03 percent, which is the random error at the 99-percent confidence level ( $3.499 S_m$ , where  $S_m$  is the standard error of the mean computed from independent measurements of 8 samples) and 3.37 percent, which is the estimated upper limit of conceivable systematic errors.

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

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Office of Standard Reference Materials

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