

National Bureau of Standards

Certificate

Standard Reference Material 4242

Mixed Radionuclide Gamma-Ray Emission-Rate Standard

This sample consists of manganese-54, cobalt-57, cobalt-60, yttrium-88, cadmium-109, tin-113-indium-113m, and cesium 137-barium-137m in approximately 450 ml of approximately 4N HCl in a flame-sealed soft-glass bottle.

This sample was made by weighing an aliquot of a calibrated radionuclide mixture into the bottle containing the acid, and flame sealing. The gamma-ray-emission rates of the solutions used to prepare the radionuclide mixture were determined by means of the NBS calibrated 4π ionization chamber, and assumed nuclear decay parameters.

The nuclear gamma-ray-emission rates at 1200 EST January 15, 1972, are shown in the table below.

| Nuclide | γ-Ray Energy (MeV)* | γ-Ray Intensity (%)* | Half Life | γ/s | Errors % | | |
|---------------------------------------|---------------------|----------------------|-----------|-----|----------|---------|-------|
| | | | | | Random | System. | Total |
| ¹⁰⁹ Cd | 0.0877 | | 1.2727y | | 0.3 | 2.7 | 3.0 |
| ⁵⁷ Co | 0.122 | 85.6±0.2 | 271.76d | | 0.1 | 2.2 | 2.3 |
| ¹¹³ Sn- ^{113m} In | 0.392 | | 115.31d | | 0.1 | 2.8 | 2.9 |
| ¹³⁷ Cs- ^{137m} Ba | 0.662 | 84.6±0.4 | 29.93y | | 0.1 | 1.9 | 2.0 |
| ⁵⁴ Mn | 0.835 | 99.978±0.002 | 312.27d | | 0.1 | 2.5 | 2.6 |
| ⁶⁰ Co | 1.173 | 99.88±0.02 | 5.261y | | 0.1 | 1.3 | 1.4 |
| | 1.333 | 100. | | | 0.1 | 1.3 | 1.4 |
| ⁸⁸ Y | 0.898 | 93.4±0.7 | 106.61d | | 0.1 | 2.9 | 3.0 |
| | 1.836 | 99.37±0.02 | | | | 2.2 | 2.3 |

*Nuclear Data Tables, A8, Nos. 1-2 (Oct. 1970).

The total uncertainties in the gamma-ray-emission rates are the linear sums of the respective random errors (limit of random error at the 99 percent confidence level), the above-stated errors in the gamma-ray intensities, and the estimated upper limits of conceivable systematic errors.

The gamma-ray-emission rate of all other contaminants was less than 0.06 percent of the total gamma-ray-emission rate on January 15, 1972.

This standard was prepared in the NBS Center for Radiation Research, Nuclear Radiation Division, Radioactivity Section, W. B. Mann, Chief.

Washington, D.C. 20234
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 Office of Standard Reference Materials

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