

# National Bureau of Standards

## Certificate

Standard Reference Material 4252

Mixed Radionuclide Radioactivity Standard

This standard consists of chromium-51, manganese-54, cobalt-58, iron-59, cobalt-60, zinc-65, cesium-134, cesium-137, and cerium-144 in grams of approximately 4N HCl in a flame-sealed borosilicate glass bottle of standard dimensions. The solution also contains approximately 15 ppm by weight of stable cation carrier for each of the radionuclides listed above.

This standard was made by weighing an aliquot of a calibrated radionuclide mixture into the bottle containing the acid. This calibrated mixture was prepared by mixing standardized solutions of the individual radionuclides.

The cerium-144 was calibrated by gamma-ray intercomparison with material which had previously been standardized by  $4\pi\beta\text{-}\gamma$  coincidence counting. The radioactivities of the other standardized solutions used were determined by means of the NBS calibrated  $4\pi\gamma$ -ionization chamber.

The radioactivities of the constituents in nuclear transformations per second at 1200 EST January 15, 1973, are shown in the table below.

| Radionuclide         | ntps | Uncertainty % |            | Total |
|----------------------|------|---------------|------------|-------|
|                      |      | Random        | Systematic |       |
| <sup>51</sup> Cr     |      | 0.1           | 4.2        | 4.3   |
| <sup>54</sup> Mn     |      | 0.1           | 2.5        | 2.6   |
| <sup>58</sup> Co     |      | 0.1           | 2.9        | 3.0   |
| <sup>59</sup> Fe     |      | 0.1           | 2.6        | 2.7   |
| <sup>60</sup> Co     |      | 0.1           | 1.3        | 1.4   |
| * <sup>65</sup> Zn   |      | 0.1           | 2.6        | 2.7   |
| <sup>134</sup> Cs    |      | 0.1           | 2.5        | 2.6   |
| ** <sup>137</sup> Cs |      | 0.1           | 2.0        | 2.1   |
| <sup>144</sup> Ce    |      | 0.7           | 2.3        | 3.0   |

\* Assuming a gamma-ray intensity of  $50.6 \pm 0.4\%$  for the 1.115-MeV gamma ray.

\*\* Assuming a gamma-ray intensity of  $85.0 \pm 0.3\%$  for the 0.662-MeV gamma ray.

The uncertainties in the radioactivities are the 99-percent-confidence limits for the random error components, and the linear sums of the estimated upper limits of conceivable systematic errors.

This standard contains cobalt-57 as an impurity. The cobalt-57 activity was less than 0.1 percent of the total activity on January 15, 1973. The gamma-ray energy spectrum of the standard was examined with a Ge(Li)-spectrometer, and no other impurity was observed.

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

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J. Paul Cali, Chief  
 Office of Standard Reference Materials