



National Institute of Standards & Technology

Certificate

Standard Reference Material 4400H-N Radioactivity Standard

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| Radionuclide | Chromium-51 |
| Source identification | 4400H-N |
| Source description | Liquid in NIST borosilicate-glass ampoule ^{(1)*} |
| Solution composition | Approximately 0.44 milligram of chromium per gram of 1 molar hydrochloric acid ⁽²⁾ |
| Mass | grams |
| Radioactivity concentration | $1.457 \times 10^8 \text{ Bq g}^{-1}$ |
| Reference time | 1700 EST July 28, 1992 |
| Overall uncertainty | 0.75 percent ⁽³⁾ |
| Photon-emitting impurities (Activity ratios at reference time) | $^{60}\text{Co}/^{51}\text{Cr}: (3.0 \pm 0.6) \times 10^{-6}$ ⁽⁴⁾ $^{156}\text{Eu}/^{51}\text{Cr}: (1.4 \pm 0.4) \times 10^{-4}$ |
| Half life | $27.702 \pm 0.004 \text{ days}$ ⁽⁵⁾ |
| Measuring instrument | NIST pressurized "4 π " γ ionization chamber calibrated by 4 π x- γ anti-coincidence efficiency-extrapolation technique |

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
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*Notes on back

NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:
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|----------------------|------------------------|
| body diameter | 16.5 ± 0.5 mm |
| wall thickness | 0.60 ± 0.04 mm |
| barium content | less than 2.5 percent |
| lead oxide content | less than 0.02 percent |
| other heavy elements | trace quantities |
- (2) Solution density 1.017 ± 0.002 g/mL at 23.2 °C.
- (3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or assumed approximations thereof, for the following:
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| a) 12 ionization-chamber measurements on the low-level solution | 0.02 percent |
| b) seven anti-coincidence measurements | 0.03 percent |
| c) efficiency extrapolation | 0.05 percent |
| d) background | 0.15 percent |
| e) half life | 0.01 percent |
| f) gravimetric measurements | 0.10 percent |
| g) original ionization-chamber calibration measurements | 0.01 percent |
| h) photon-emitting impurities in original calibration | 0.03 percent |
| i) correction for L/K branching | 0.02 percent |
| j) radium-226 reference sources ratios | 0.08 percent |
| k) radium reference source positioning | 0.10 percent |
| l) dilution | 0.01 percent |
| m) photon-emitting impurities in the low-level solution | 0.09 percent |
- (4) Limits of detection as a percentage of the gamma-ray-emission rate of the 320-keV gamma rays emitted in the decay of chromium-51 are
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| 0.1 percent between 20 and 315 keV |
| 0.01 percent between 325 and 1900 keV. |
- (5) NCRP Report No. 58, 2nd Edition, February 1985, p. 378.