



Certificate of Analysis

Standard Reference Material 953

NEUTRON DENSITY MONITOR WIRE^a

0.1 Wt % Co in Al

This standard is provided as a reference source of a cobalt in aluminum alloy to serve as a neutron density monitor wire standard. Accurate determination of thermal neutron densities is essential in irradiation tests in obtaining a basis for comparison of densities among reactors, in applying data in the design of reactors, in understanding the mechanisms of radiation damage, and for use in neutron activation analysis. There has been a critical need for a large supply of the 0.1 wt % cobalt in aluminum alloy, prepared to be highly homogeneous and for which an accurate determination of the cobalt content is provided.

<u>SRM No.</u>	<u>Cobalt, percent by weight</u>
953	0.114 ^b ± 0.005 ^c

- a. The neutron density monitor material is in the form of wire 0.5 mm in diameter and is available in one meter lengths, (approx. 0.6 g), or in multiples thereof. (continuous length)
- b. Methods of analysis--No detectable bias was observed between the following two methods within the precision limits estimated for either method.
 1. Spectrophotometric with 2,3-quinoxalinedithiol and 60-70 mg sample weights (E. R. Deardorff).
 2. Activation analysis, nondestructive, relative to cobalt metal foil and cobalt metal powder, and with 18-22 mg sample weights (T. E. Gills and D. A. Becker).

Washington, D. C. 20234
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W. Wayne Meinke, Chief
Office of Standard Reference Materials

(over)

- c. The error given is an upper limit for the 95% confidence interval. Additional work to evaluate systematic errors and the magnitude of possible heterogeneity in the wire is underway, but note should be made that the error quoted includes the possibility of heterogeneity.

The overall direction and coordination of the technical measurements leading to certification were performed under the chairmanship of J. R. DeVoe.

The technical and support aspects involved in the preparation, certification and issuance of this Standard Reference Material was coordinated through the Office of Standard Reference Materials by R. E. Michaelis.

It is anticipated that a final certificate will be issued for this material by about March 15, 1969.

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This standard has been established to provide a homogeneous and well-characterized neutron density monitor primarily for use in irradiation test programs on reactor materials. It will also be useful for the nuclear activation analyst in monitoring neutron densities and mapping neutron density variations in irradiation containers and in various irradiation locations within reactors. The 0.1 percent cobalt in aluminum monitor material was chosen as having (1) a well-known neutron cross section in all neutron energy ranges, (2) a suitable half life, and (3) a well-characterized energy spectrum and decay scheme. (A representative pulse-height spectrum of this irradiated standard is available on request.)

The material for SRM 953 was prepared at the Materials Research Corporation, Orangeburg, New York, with special melting, casting, and fabrication procedures designed to produce a large quantity of material of the highest possible homogeneity. The selected high-purity starting materials were tested for the presence of significant quantities of high capture cross section elements at NBS by activation and spectrochemical analysis, and the material was found to be entirely acceptable.

Extensive homogeneity testing was performed at the NBS laboratories in Gaithersburg, Maryland, and in Boulder, Colorado, and the material was found to be entirely satisfactory for its intended use as a neutron density monitor, both on macro and micro scale amounts. The testing was performed by using the methods of analysis indicated under footnote b (see over), but also including electron probe microanalysis (R. L. Myklebust and K. F. J. Heinrich), and electrical measurements for residual resistivity ratios, R_{273K}/R_{4K} (J. G. Hust and R. L. Powell).