U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards
Certificate of Analysis
Standard Reference Material 689
Ferrochromium Silicon

(In cooperation with the American Society for Testing and Materials)

This material is in the form of fine powder for use in checking chemical methods of analysis and in calibration with instrumental methods of analysis.

Constituent	Certified Value,[1] Percent by Weight	Estimated Uncertainty[2]
Carbon	0.043	0.002
Manganese	.32	.01
Phosphorus	.026	.002
Sulfur	.002	.001
Silicon	39.5	.4
Copper	0.013	.002
Nickel	.20	.03
Chromium	36.4	.2
Vanadium	0.09	.01
Aluminum	.049	.004
Titanium	.40	.01
Cobalt	.034	.003
Iron	23.2	.2
Boron	0.0017	.0004

[1] The certified values listed for a constituent is the present best estimate of the "true" value based on the results of the cooperative program for certification.

[2] The estimated uncertainty listed for a constituent is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability for samples 0.5 g or more. (No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most constituents.)

The overall coordination of the technical measurements leading to certification was performed under the direction of J.I. Shultz, Research Associate, ASTM-NBS Research Associate Program.

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

Washington, D.C. 20234
February 24, 1982

George A. Uriano, Chief
Office of Standard Reference Materials

(over)

SUPPLEMENTARY DATA

The following data for the specific molar absorbances, water content, photon yields, and fluorescence lifetimes are considered to be supplementary and are not to be considered certified values.

The quinine sulfate dihydrate (QSD) used for SRM 936 was found to be homogeneous to better than 0.5% by thin-layer chromatography with development by two solvent systems and the determination of specific molar absorbances, ϵ, at three different wavelengths. The SRM contains approximately 1.7% of an impurity as determined by high performance liquid chromatography using absorbance and fluorescence detection. This impurity is believed to be dihydroquinine sulfate dihydrate, which has optical characteristics that are similar to those of the quinine sulfate dihydrate. The ultraviolet absorption spectrum of SRM 936 in 0.105 mol/L $HClO_4$ exhibits the following absorption maxima:

$$250.0 \text{ nm}, \epsilon_{max} = 56{,}990 \pm 90 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$$
$$347.5 \text{ nm}, \epsilon_{max} = 10{,}810 \pm 20 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$$

and, on the side of a peak:

$$365.0 \text{ nm}, \epsilon_{obs} = 6{,}920 \pm 10 \text{ L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$$

The water content of this material was measured by two methods. The average of six determinations by the Karl-Fischer method gave a value of (4.74 ± 0.05%), while the average of four determinations by a weight loss procedure gave a value of (4.57 ± 0.04%). The theoretical value for water in quinine sulfate dihydrate is 4.60%.

The photon yield, Q, and the fluorescence lifetime, τ, of SRM 936 were compared to values obtained for a sample of purified quinine sulfate dihydrate and are summarized below:

	Q 0.5 mol/L H_2SO_4	τ, ns 0.5 mol/L H_2SO_4
SRM 936, QSD	0.544 ± 0.03	19.1 ± 0.1
Purified QSD	0.546[a]	19.2 ± 0.1

[a]Melhuish, W. H., J. Phys. Chem. **65**, 229 (1961); *ibid,* New Zealand J. Sci. Tech. **37**, 142 (1955).