



National Bureau of Standards
Certificate of Analysis
Standard Reference Material 1835
Borate Ore

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

This Standard Reference Material (SRM) is a fine powder of borate ore and is intended for use in the evaluation of chemical and instrumental methods of analysis. SRM 1835 has the certified chemical composition shown below:

| <u>Constituent</u> | <u>Percent by Weight^a</u> | <u>Uncertainty^b</u> |
|-------------------------------------|--------------------------------------|--------------------------------|
| SiO ₂ | 18.408 | 0.078 |
| Al ₂ O ₃ | 3.474 | 0.058 |
| B ₂ O ₃ | 18.739 | 0.115 |
| BaO | 0.0497 | 0.0055 |
| CaO | 21.622 | 0.189 |
| F | 0.348 | 0.014 |
| Fe ₂ O ₃ | 1.141 | 0.014 |
| K ₂ O | 1.261 | 0.012 |
| MgO | 3.411 | 0.040 |
| MnO | 0.0333 | 0.0018 |
| Na ₂ O | 3.484 | 0.044 |
| SO ₃ | 1.477 | 0.023 |
| SrO | 0.9418 | 0.0099 |
| TiO ₂ | 0.1332 | 0.0043 |
| LOI + H ₂ O ^c | 25.724 | 0.101 |

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

^b The estimated uncertainty is the standard error of the best estimate of the "true" value and represents both best judgment and an evaluation of the combined effects of measurement error, method bias, between laboratory variability, and material variability.

^c LOI was determined at 870 °C and loss of H₂O at 110 °C. Performing LOI at a temperature higher than 870 °C may cause volatile losses of some constituents.

Caution for use of this SRM: This material may exhibit microheterogeneity for some constituents. Therefore a minimum sample size of 0.25 g must be used for analyses to insure a sample of comparable homogeneity to that for which certification analyses were performed. SRM 1835 should be analyzed as received. A moisture determination (H₂O) at 110 °C or drying of the SRM should not be done prior to analysis for other constituents. Experience in the cooperative testing program indicates that this borate ore loses weight at 110 °C with time and it may take several days to reach a constant weight and that the weight loss is not necessarily caused entirely by loss of free moisture but also may include loss attributable to a breakdown of crystalline (chemically combined) water.

Gaithersburg, MD 20899
September 14, 1987

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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Supplemental Information

The borate ore used to prepare this SRM was ground and then screened through a 200-mesh sieve in order to obtain a fine powder. Homogeneity was tested by A.F. Marlow and P.A. Pella, Gas and Particulate Science Division, Center for Analytical Chemistry, using x-ray fluorescence analysis. The results of the homogeneity test for a fused sample using Si, Al, etc. as indicators shows the sample to be homogeneous.

The standard deviation of a single measurement for a given constituent has been calculated from the results of the cooperative testing program. These values are not certified, but because they may be of interest to the user of this SRM, they are presented in the following table for informational use.

| <u>Constituent</u> | <u>Standard Deviation of a Single Measurement^a</u> |
|--------------------------------|---|
| SiO ₂ | 0.195 |
| Al ₂ O ₃ | 0.154 |
| B ₂ O ₃ | 0.315 |
| BaO | 0.0123 |
| CaO | 0.529 |
| F | 0.035 |
| Fe ₂ O ₃ | 0.041 |
| K ₂ O | 0.029 |
| MgO | 0.151 |
| MnO | 0.0045 |
| Na ₂ O | 0.129 |
| SO ₃ | 0.051 |
| SrO | 0.028 |
| TiO ₂ | 0.011 |
| LOI + H ₂ O | 0.256 |

^a The standard deviation is the standard deviation of a single measurement from the results of the cooperative testing program.

The overall direction and coordination of the cooperative analysis leading to certification were performed by G.D. Bowling, Chairman of ASTM Subcommittee C-14.02 on Chemical Analysis of Glass and Glass Products.

The procurement and development of this material as an SRM was under the direction of the joint NBS-ASTM Glass Research Associate Program. This program was coordinated through ASTM by: M.J. Cellarosi, Chairman of ASTM Committee on Glass and Glass Products; H.E. Hagy, Chairman of Subcommittee 14.91 on Standard Reference Materials; and A.C. Seifert, NBS-ASTM Research Associate.

Consultation and statistical analyses of the cooperative test results were performed by J. Mandel of the National Measurement Laboratory at the National Bureau of Standards.

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

The material for this SRM was furnished to NBS by the American Borate Company, Las Vegas, NV.

The laboratories participating in the cooperative certification analyses were:

Anchor Hocking Corp., Lancaster, PA
Corning Glass Works, Corning, NY
Emhart Industries, Windsor, CT
Owens-Corning Fiberglass, Granville, OH
Owens-Illinois Inc., Toledo, OH
Owens-Illinois Inc., Vineland, NJ
Wheaton Glass, Millville, NJ