



# Certificate of Analysis

## Standard Reference Material<sup>®</sup> 1831

Soda-Lime Sheet Glass (1.2 % Al<sub>2</sub>O<sub>3</sub>)

(In Cooperation with ASTM)

This Standard Reference Material (SRM) is intended for use in checking chemical methods of analysis and in calibrating instrumental methods of analysis. A unit of SRM 1831 consist of three platelets 37 mm square. The certified values are listed in Table 1 and represent the present best estimate of the “true value” based on the results of the cooperative program for certification. All values are reported as mass fractions [1].

The uncertainties listed are expressed as “combined uncertainties” calculated according to the ISO and NIST Guides [2]. Each uncertainty is based on the 95 % confidence limit of the “true value,” and is intended to represent the combined effect of uncertainty components associated with various analytical factors such as method imprecision, possible systematic errors among methods, and material variability.

Table 1. Certified Mass Fractions

Constituent	Mass Fraction (in %)
SiO <sub>2</sub>	73.08 <sup>(a,l)</sup> ± 0.08
Na <sub>2</sub> O	13.32 <sup>(a,m,f,c)</sup> ± 0.05
CaO	8.20 <sup>(a,m,k,g)</sup> ± 0.05
MgO	3.51 <sup>(a,m,i,k)</sup> ± 0.05
Al <sub>2</sub> O <sub>3</sub>	1.21 <sup>(a,m,k,n,j,i,e)</sup> ± 0.04
K <sub>2</sub> O	0.33 <sup>(a,c,m,e)</sup> ± 0.02
SO <sub>3</sub>	0.25 <sup>(a,b)</sup> ± 0.01
Fe <sub>2</sub> O <sub>3</sub> (total iron as)	0.087 <sup>(a,m,h)</sup> ± 0.003
FeO	0.025 <sup>(a)</sup> ± 0.007
TiO <sub>2</sub>	0.019 <sup>(a,d,h)</sup> ± 0.002

**Methods Used:** The primary procedures used in the analysis of this SRM are those recommended for referee analysis in ASTM C 169, Standard Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass. All methods used in the certification of SRM 1831 are cited in Table 1.

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|---|---|---|
| <sup>(a)</sup> ASTM C 169 referee analysis      | <sup>(l)</sup> Magnesium Uranyl Acetate           | <sup>(k)</sup> Complexometric                   |
| <sup>(b)</sup> Combustion                       | <sup>(g)</sup> KMnO <sub>4</sub> Titration        | <sup>(l)</sup> Gravimetric (Single-Dehydration) |
| <sup>(c)</sup> Flame Emission                   | <sup>(h)</sup> X-ray Fluorescence                 | <sup>(m)</sup> Atomic Absorption                |
| <sup>(d)</sup> Spectrophotometry                | <sup>(i)</sup> Gravimetric (8-Hydroxyquinoline)   | <sup>(n)</sup> Gravimetric (Double Precipitate) |
| <sup>(e)</sup> Butyl Alcohol, HClO <sub>4</sub> | <sup>(j)</sup> Gravimetric (Single-Precipitation) |   |

The technical and support aspects involved in the original preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by W.P. Reed and R.K. Kirby.

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Analytical Chemistry Division

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Certificate Issue Date: 22 December 2008  
See Certificate Revision History on Last Page

Support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

**CAUTION:** Before using the SRM in checking chemical analysis, it must be ground in agate to -200 mesh.

**Homogeneity<sup>1</sup>:** This material was tested for homogeneity at NIST by P.A. Pella and R.L. Myklebust of the NIST Analytical Chemistry Division using X-ray fluorescence spectrometry. Three to five replicate measurements were made on at least 10 elements in each of 15 samples chosen at random from the lot of material. The results did not indicate any significant difference between the samples; the relative standard deviation for each element was less than 1 %.

The material for this SRM was prepared and furnished to NIST by The Pittsburgh Plate Glass Industries, Inc., Pittsburgh, PA.

Development of this SRM is part of the program of ASTM Subcommittee C14.91 on Standard Reference Materials, H.E. Hagy, Chairman. The overall direction and coordination of the cooperative analyses leading to certification originally and in revision to include iron oxide were performed by G.D. Bowling, Chairman of ASTM Subcommittee C14.02 on Chemical Properties and Analysis of Glass and Glass Products.

Cooperative analyses for certification were performed in the following laboratories:

Anchor Hocking Corp., Lancaster, OH  
Broadway Glass Co., Inc., Brockway, PA  
Corning Glass Works, Corning, NY  
Emhart Industries, Inc., Windsor, CT  
Ford Motor Co., Lincoln Park, MI  
Libbey-Owens-Ford Co., Toledo, OH

Monarch Analytical Laboratories, Inc., Toledo, OH  
Owens-Corning Fiberglass Corp., Granville, OH  
Owens-Illinois, Inc., Toledo, OH and Vineland, NJ  
Pennsylvania State University, University Park, PA  
Schott Glass Technologies, Inc., Duryea, PA  
Sharp-Schurtz Co., Lancaster, PA  
Thatcher Glass Co., Elmira, NY

**Maintenance of SRM Certification:** NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate this notification.

#### REFERENCES

- [1] Thompson, A.; Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811 (2008); available at: [http://ts.nist.gov/WeightsAndMeasures/Metric/mpo\\_pubs.cfm](http://ts.nist.gov/WeightsAndMeasures/Metric/mpo_pubs.cfm).
- [2] ISO; *Guide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed., International Organization for Standardization: Geneva, Switzerland (1993); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at <http://physics.nist.gov/Pubs/>.

**Certificate Revision History:** 22 December 2008 (Editorial revision); 18 October 2005 (Removal of Table 2 and updated uncertainty values); 10 September 19991 (Iron oxide added); 18 July 1982 (Original certificate date).

*Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-2200; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*

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<sup>1</sup>Certain commercial equipment, instruments, or materials are identified in this report to specify adequately the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.