



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 853a

Aluminum Alloy 3004 (chip form)

This Standard Reference Material (SRM) is intended primarily for use in evaluating chemical and instrumental methods of analysis. A unit of SRM 853a consists of a bottle containing approximately 25 grams of fine millings.

The certified values for 10 elements in SRM 853a are listed in Table 1. A reference value for one element is listed in Table 2. Information values for four elements are listed in Table 3. For all elements, values are reported as mass fractions [1]. Value assignment categories are based on the definition of terms and modes used at NIST for chemical reference materials [2] and uncertainties are assessed according to the ISO/JCGM Guide [3].

Certified Values: A NIST-certified value is a value for which NIST has the highest confidence in its accuracy, in that all known or suspected sources of bias have been investigated or taken into account. A certified value is the present best estimate of the “true” value based on the results of analyses performed at NIST and collaborating laboratories using the test methods listed in Table 4. The uncertainty listed with the value is an expanded uncertainty based on a 95 % confidence interval [4] and is calculated according to the method in the ISO/JCGM Guide [3].

Reference Value: Reference values are non-certified values that are the present best estimates of the true values. However, the values do not meet the NIST criteria for certification and are provided with associated uncertainties that may not include all sources of uncertainty. The uncertainty listed with the value is an expanded uncertainty based on a 95 % confidence interval [4] and is calculated according to the method in the ISO/JCGM Guide [3].

Information Values: Information values for additional constituents of SRM 853a are given in Table 3. An information value is considered to be a value that will be of interest to the SRM user, but insufficient information is available to assess the uncertainty associated with the value. Information values cannot be used to establish metrological traceability.

Expiration of Certification: The certification of **SRM 853a** is valid indefinitely, within the measurement uncertainty specified, provided the SRM is handled and stored in accordance with instructions given in this certificate (see “Instructions for Use”). Periodic recertification of this SRM is not required. The certification will be nullified if the SRM is damaged, contaminated or otherwise modified.

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

Coordination of the technical measurements for certification was accomplished under the direction of J.R. Sieber of the NIST Chemical Sciences Division.

Analytical measurements for certification of this SRM were performed by M.R. Winchester of the NIST Chemical Sciences Division.

Statistical consultation for this SRM was provided by S.D. Leigh and D.D. Leber of the NIST Statistical Engineering Division.

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Steven J. Choquette, Director
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Gaithersburg, MD 20899
Certificate Issue Date: 29 September 2020
Certificate Revision History on Last Page
SRM 853a

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

Material Preparation: The material for SRM 853a was obtained in the form of a single casting prepared by the Aluminum Company of America (New Kensington, PA, USA)⁽¹⁾. Titanium was added for grain refinement of the alloy. The casting was chipped, blended and bottled at NIST under the supervision of D.F. Friend of the NIST Material Measurement Laboratory.

INSTRUCTIONS FOR USE

To relate analytical determinations to the certified values on this Certificate of Analysis, a minimum sample quantity of 200 mg is recommended. The millings do not require preparation prior to weighing and dissolution. The material should be stored in its original container in a cool, dry location.

Table 1. Certified Values for SRM 853a Aluminum Alloy 3004^(a)

Elements	Mass Fraction (%)	Expanded Uncertainty (%)	Coverage Factor, <i>k</i>
Silicon (Si)	0.1810	0.0046	4.3
Iron (Fe)	0.504	0.015	2.1
Copper (Cu)	0.1504	0.0045	2.0
Manganese (Mn)	1.251	0.011	2.0
Magnesium (Mg)	1.092	0.027	2.0
Nickel (Ni)	0.00429	0.00085	2.0
Zinc (Zn)	0.0514	0.0014	4.3
Titanium (Ti)	0.0205	0.0012	2.0
Vanadium (V)	0.01842	0.00061	2.1
Gallium (Ga)	0.0176	0.0032	13

^(a) The measurands are the mass fractions of the elements. The certified values are metrologically traceable to the SI unit of mass, expressed as a percent.

Table 2. Reference Value for SRM 853a Aluminum Alloy 3004^(a)

Element	Mass Fraction (%)	Expanded Uncertainty (%)	Coverage Factor, <i>k</i>
Zirconium (Zr)	0.0023	0.0005	2.1

^(a) The measurand is the mass fraction of the elements listed, as determined by the analytical methods indicated in Table 4. The reference value is metrologically traceable to the SI unit of mass, expressed as a percent.

Table 3. Information Values for SRM 853a Aluminum Alloy 3004

Elements	Mass Fraction (%)
Chromium (Cr)	<0.0005
Strontium (Sr)	<0.0001
Tin (Sn)	0.0003
Lead (Pb)	<0.003

⁽¹⁾Certain commercial equipment, instruments, or materials are identified in this certificate in order to adequately specify 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.

Cooperating Laboratories: Analytical determinations for certification of this SRM were performed by the following laboratories:

Alcan International Limited, Arvida Research and Development Centre, (Jonquière, Québec, Canada). Coordinated by H. Hamouche.

Aluminum Company of America, Alcoa Technical Center, Alcoa Center (New Kensington, PA, USA). Coordinated by M. Ruschak.

Table 4. Analytical Methods

Element	Methods ^(a)
Si	GD-OES, ICP-OES
Fe	GD-OES, ICP-OES
Cu	GD-OES, ICP-OES
Mn	GD-OES, ICP-OES, Colorimetry
Mg	GD-OES, ICP-OES, FAAS
Ni	GD-OES, ICP-OES
Zn	GD-OES, ICP-OES
Ti	GD-OES, ICP-OES
V	GD-OES, ICP-OES
Ga	GD-OES, ICP-OES
Zr	GD-OES, ICP-OES
Cr	GD-OES
Sr	GD-OES
Sn	ICP-OES
Pb	GD-OES

^(a) Key: GD-OES = Glow Discharge Optical Emission Spectrometry at NIST
ICP-OES = Inductively-Coupled Plasma Optical Emission Spectrometry
Colorimetry = Oxidation by KIO₄ followed by absorbance measurements at 545 nm.
FAAS = Flame Atomic Absorption Spectrophotometry

REFERENCES

- [1] Thompson A; Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811, U.S. Government Printing Office: Washington, DC (1995); available at <https://www.nist.gov/pml/special-publication-811> (accessed Sep 2020).
- [2] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-136; U.S. Government Printing Office: Washington, DC (2000); available at <https://www.nist.gov/system/files/documents/srm/SP260-136.PDF> (accessed Sep 2020).
- [3] JCGM 100:2008; *Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement (GUM 1995 with Minor Corrections)*; Joint Committee for Guides in Metrology (2008); available at https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Sep 2020); 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 <https://www.nist.gov/pml/nist-technical-note-1297> (accessed Sep 2020).
- [4] Hahn, G.J., and Meeker, W.Q.; *Statistical Intervals: A Guide for Practitioners*, John Wiley & Sons, Inc: New York (1991).

Certificate Revision History: 29 September 2020 (Editorial correction to the unit size; title updated; editorial changes); 09 September 2014 (Extension of certification period, editorial changes); 09 October 2003 (Original certificate date).
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Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730, email srminfo@nist.gov, or via the Internet <https://www.nist.gov/srm>.