National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 854a

Aluminum Alloy 5182
(chip form)

This Standard Reference Material (SRM) is intended primarily for use in evaluating chemical and instrumental methods of analysis. A unit of SRM 854a consists of a bottle containing approximately 25 g of fine millings.

The certified values for 10 elements in SRM 854a are listed in Table 1. A reference value for one element is listed in Table 2. Information values for two 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].

Certified Mass Fraction 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 account [2]. 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 [3] and is calculated according to the method in the ISO/JCGM Guide [4].

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

Information Mass Fraction Values: Information values are considered to be values that will be of interest to the SRM user, but insufficient information is available to assess the uncertainties associated with the values. Information values cannot be used to establish metrological traceability.

Expiration of Certification: The certification of **SRM 854a** is valid indefinitely, within the measurement uncertainty specified, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). Accordingly, periodic recertification of this SRM is not required. However, 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 of this SRM was under the direction of J.R. Sieber of the NIST Analytical Chemistry Division.

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

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Gaithersburg, MD 20899
Certificate Issue Date: 29 September 2020
Certificate Revision History on Last Page

Steven J. Choquette, Director
Office of Reference Materials

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

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

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 854a Aluminum Alloy 5182

Constituent	Value (mass fraction) (%)	Expanded Uncertainty [a] (mass fraction) (%)	Coverage Factor (*k*)
Silicon (Si)	0.1553	0.0028	2.4
Iron (Fe)	0.1990	0.0049	4.3
Copper (Cu)	0.0494	0.0013	2.1
Manganese (Mn)	0.3753	0.0057	2.0
Magnesium (Mg)	4.474	0.070	2.0
Nickle (Ni)	0.0195	0.0007	2.6
Zinc (Zn)	0.0505	0.0009	4.3
Titanium (Ti)	0.0335	0.0011	2.0
Vanadium (V)	0.0174	0.0005	2.0
Chromium (Cr)	0.0340	0.0010	4.3

[a] The measurands are the mass fractions of the elements. The certified values are metrologically traceable to the SI unit of mass. The assigned value is an unweighted mean of the results from two analytical methods across three laboratories. The uncertainty listed with the value is an expanded uncertainty about the mean, with coverage factor *k*, calculated by combining a between-method variance with a pooled, within-method variance following the ISO/JCGM Guide [4,5].

Table 2. Reference Value for SRM 854a Aluminum Alloy 5182

Constituent	Value (mass fraction) (%)	Expanded Uncertainty [a] (mass fraction) (%)	Coverage Factor (*k*)
Gallium (Ga)	0.0185	0.0009	2.4

[a] The measurand is the mass fraction of Gallium, as determined by the analytical methods indicated in Table 4. The reference value is metrologically traceable to the SI derived unit of mass. The assigned value is an unweighted mean of the results from two analytical methods across three laboratories. The uncertainty listed with the value is an expanded uncertainty about the mean, with coverage factor *k*, calculated by combining a between-method variance with a pooled, within-method variance following the ISO/JCGM Guide [4,5].

Table 3. Information Values for SRM 854a Aluminum Alloy 5182

Constituent	Value mass fraction (%)
Cadmium (Cd)	0.0006
Strontium (Sr)	0.0002

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); H. Hamouche.
Aluminum Company of America, Alcoa Technical Center, Alcoa Center (New Kensington, PA, USA); M. Ruschak.

Material Preparation: The material for SRM 854a was obtained in the form of a single casting prepared by the Aluminum Company of America[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 and M.P. Cronise of the Measurement Services Division.

Table 4. Analytical Methods

Element	Methods
Si	GD-OES; ICP-OES
Fe	GD-OES; ICP-OES
Cu	GD-OES; ICP-OES
Mn	GD-OES; ICP-OES
Mg	GD-OES; ICP-OES
Ni	GD-OES; ICP-OES
Zn	GD-OES; ICP-OES
Ti	GD-OES; ICP-OES
V	GD-OES; ICP-OES
Cr	GD-OES; ICP-OES
Ga	GD-OES; ICP-OES
Cd	SS-OES
Sr	GD-OES

Methods Key:

GD-OES (Glow Discharge Optical Emission Spectrometry at NIST)
ICP-OES (Inductively-Coupled Plasma Optical Emission Spectrometry at Cooperating Laboratories)
SS-OES (Spark Source Optical Emission Spectrometry at Cooperating Laboratories)

[1] Certain commercial equipment, instrumentation, or materials are identified in this certificate to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institutes of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

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: Gaithersburg, MD (2000); available at https://www.nist.gov/system/files/documents/srm/SP260-136.PDF (accessed Sep 2020).

[3] Hahn, G. J., and Meeker, W. Q.; *Statistical Intervals: A Guide for Practitioners*; John Wiley & Sons, Inc.: New York (1991).

[4] 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).

[5] Levenson, M.S.; Banks, D.L.; Eberhardt, K.R.; Gill, L.M.; Guthrie, W.F.; Liu, H.K.; Vangel, M.G.; Yen, J.H.; Zhang, N.F.; *An Approach to Combining Results from Multiple Methods Motivated by the ISO GUM*; J. Res. Natl. Inst. Stand. Technol., Vol. 105, pp. 571–579 (2000).

Certificate Revision History: 29 September 2020 (Editorial correction to the unit size; editorial changes); 16 August 2019 (Update title; editorial changes); 04 April 2006 (Editorial changes); 08 December 2005 (Original certificate date).

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 at: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at https://www.nist.gov/srm.