

Reference Material Certificate

122/08

Aluminium Base (Type of Standard)
Al pure (99.95% – 99.8%, Set 120)

Certified Values

Element	Analytical Methods used for Certification	Mass content ¹⁾ in [%]	Uncertainty ²⁾ in [%]
Silicon (Si)	a, f	0.0502	0.0043
Iron (Fe)	a, b, c, f, g	0.0510	0.0014
Copper (Cu)	a, b, c, d, e, g	0.0199	0.0005
Manganese (Mn)	a, b, c, d, e	0.0198	0.0003
Magnesium (Mg)	a, b, c, d, e, g	0.0179	0.0005
Chromium (Cr)	a, b, c, d, e, g	0.0197	0.0004
Nickel (Ni)	a, b, c, d, e, g	0.0200	0.0005
Zinc (Zn)	a, b, c, d, e, g	0.0202	0.0005
Titanium (Ti)	a, b, c, e, f, g	0.0192	0.0009
Silver (Ag)	b, d, e	0.0188	0.0010
Arsenic (As)	c, d, e	0.0057	0.0004
Boron (B)	b, d	< 0.0002	-
Barium (Ba)	a, b, c, d, e	0.0010	0.0001
Beryllium (Be)	a, b, c, d, e	0.00048	0.00002
Bismuth (Bi)	a, b, c, e	0.0094	0.0003
Calcium (Ca)	b, c	0.0007	0.0005
Cadmium (Cd)	a, b, c, d, e, g	0.0049	0.0002
Cerium (Ce)	a, b, c, d, e	0.0141	0.0006
Cobalt (Co)	a, b, c, d, e	0.0149	0.0005
Gallium (Ga)	a, b, c, d, e	0.0192	0.0004
Mercury (Hg)	e, h	0.0076	0.0003
Indium (In)	a, b, c, d, e	0.0112	0.0005
Lanthanum (La)	a, b, c, e	0.0205	0.0005
Lithium (Li)	a, b, c, d, e, g	0.00083	0.00005
Molybdenum (Mo)	a, b, c, e	0.0096	0.0002
Sodium (Na)	b, c, d, e	0.0021	0.0004
Phosphorus (P)	c, d, e	0.0041	0.0005

Element	Analytical Methods used for Certification	Mass content ¹⁾ in [%]	Uncertainty ²⁾ in [%]
Lead (Pb)	b, c, e, g	0.0100	0.0004
Antimony (Sb)	c, e	0.0100	0.0005
Scandium (Sc)	a, b, c, d, e	0.0046	0.0001
Tin (Sn)	a, b, c, e	0.0101	0.0003
Strontium (Sr)	a, b, c, d, e	0.0011	0.0001
Tantalum (Ta)	b, c, e	0.0008	0.0001
Thallium (Tl)	b, c, d, e	0.0130	0.0005
Vanadium (V)	a, b, c, e, g	0.0203	0.0007
Tungsten (W)	b, c, e	0.0102	0.0003
Zirconium (Zr)	b, c, e	0.0153	0.0003

1) Unweighted mean value of the means of accepted sets of data (consisting of at least 5 but usually 6 single results), each set being obtained by a different digestion and / or method of measurement.

2) The half width confidence interval C(95%) is an expression of the uncertainty of the certified value, where $C(95\%) = (t \times S_M / \sqrt{n})$ and "t" is the appropriate two sided Student's t value at the 95% confidence level for "n" acceptable mean values and S_M is the single standard deviation calculated from the individual results.

Analytical Methods used for Certification:

- a ICP-OES, digestion with caustic soda
- b ICP-OES, digestion with acid
- c ICP-OES, closed vessel digestion with acid
- d ICP-MS, digestion with acid
- e ICP-MS, closed vessel digestion with acid
- f Spectrophotometry
- g FAAS, digestion with acid
- h CV-AAS, closed vessel digestion with acid

Abbreviations:

- ICP-OES – Inductively coupled plasma - optical emission spectrometry
- ICP-MS – Inductively coupled plasma - mass spectrometry
- FAAS – Flame atomic absorption spectrometry
- CV-AAS – Cold vapor atomic absorption spectrometry

Manufacturing

This certified reference material for the analysis of aluminium and its alloys is produced using six strand vertical continuous casting out of a single melt.

Analysis

The analysis of this material was performed in our ISO/IEC 17025 accredited analytical laboratory (STS 0023) by different established wet chemical procedures. Every certified value is the result of multiple independent analyses.

Homogeneity

Homogeneity testing is performed by means of spark emission spectroscopy. Tests involve making multiple measurements on individual samples taken at regular intervals along the entire length of each cast rod. Depending on the mass content of the element, the relative standard deviation of multiple measurements between discs or within one disc is typically found between 0.3% - 1% for alloying and other elements and 0.5% - 5% for trace elements.

Description of Sample

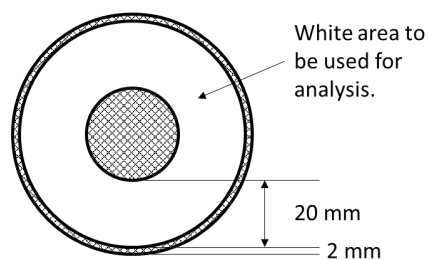
This reference material is available in the form of discs (approx. 68mm diameter and 25mm height)

Intended use and Stability

This certified reference material is primarily intended for use in spark optical emission spectroscopy. Other applications are X-ray fluorescence spectrometry (XRF) and classical wet chemical procedures. The minimum sample size for wet chemical analysis is 0.2g. The material will remain stable for the period given below (certification validity) if it is stored in a dry and clean environment at room temperature.

Instructions for Use

Calibration measurements should be made within a ring between 2mm and 22mm from the edge of the CRM face. For wet chemical analysis chips have to be prepared by turning or milling of the sample surface.



Traceability

Traceability of the certified mass contents to the SI (Système International d'Unités) is ensured by calibration using certified standard solutions or pure metals or substances of known stoichiometry.

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Certificate version 002: 12-Jan-2022
This certificate is valid until: Jan / 2096