

Certified Reference Material - CRM**117/05**

Aluminium Base (Type of Standard)

Al pure (99.99 – 99.95% Al), Set 110



ISO 17034 (SRMS 0006)

Certified Values

Element	Analytical methods used for certification	Mass fraction ¹⁾ in [%]	Uncertainty ²⁾ in mass fraction [%]
Silicon (Si)	a, g, h	0.0167	0.0007
Iron (Fe)	a, b, c, e, i	0.0154	0.0004
Copper (Cu)	b, c, d, e	0.0026	0.0001
Manganese (Mn)	a, b, c, d	0.0010	0.0001
Magnesium (Mg)	b, d, e	0.0024	0.0002
Chromium (Cr)	a, b, c, d, e	0.0018	0.0001
Nickel (Ni)	a, b, c, d, e, f	0.0020	0.0001
Zinc (Zn)	b, c, d, e	0.0021	0.0001
Titanium (Ti)	a, b, c, d, e	0.0010	0.0002
Silver (Ag)	b, c, d, e	0.0006	0.0001
Arsenic (As)	b, c, d, e	0.0035	0.0004
Boron (B)	b, d	0.0014	0.0003
Barium (Ba)	b, c, d, e	0.00013	0.00002
Beryllium (Be)	a, b, c, d	0.00044	0.00002
Bismuth (Bi)	b, c, d, e	0.0037	0.0002
Calcium (Ca)	b, c	0.0008	0.0002
Cadmium (Cd)	a, b, c, d, e	0.00068	0.00002
Cerium (Ce)	a, b, c, d, e	0.0150	0.0006
Cobalt (Co)	a, b, c, d, e	0.0022	0.0001
Gallium (Ga)	a, b, c, d, e	0.0017	0.0002
Mercury (Hg)	c, d, e, k	0.0013	0.0001
Indium (In)	b, c, d, e	0.0010	0.0003
Lanthanum (La)	a, b, c, d, e	0.0015	0.0002
Lithium (Li)	b, c, d, e	0.00036	0.00005
Molybdenum (Mo)	a, b, c, d, e	0.0018	0.0001
Sodium (Na)	b, g	0.00040	0.00010
Phosphorous (P)	b, c, d	0.0015	0.0003

Element	Analytical methods used for certification	Mass fraction ¹⁾ in [%]	Uncertainty ²⁾ in mass fraction [%]
Lead (Pb)	b, c, d, e	0.0023	0.0002
Antimony (Sb)	b, c, d, e	0.0009	0.0004
Scandium (Sc)	a, b, c, d	0.0021	0.0001
Tin (Sn)	b, c, d, e	0.0023	0.0001
Strontium (Sr)	a, b, c, e	0.0017	0.0002
Vanadium (V)	a, b, c, d, e	0.0015	0.0002
Tungsten (W)	b, c, d, e	0.0025	0.0002
Zirconium (Zr)	b, c, e	0.0018	0.0002

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⁾ Uncertainty generated from the 95% confidence interval (calculated as $C(95\%) = t \times S_M / \sqrt{n}$ where 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 of the accepted mean values) in combination with the standard deviation from sample homogeneity measurements using the square root of the summed squares.

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 FAAS, digestion with acid
- g Spark OES, solid sample analysis
- h Spectrophotometry, digestion with caustic soda
- i Spectrophotometry, digestion with acid
- k 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
- Spark OES Spark optical emission spectrometry

Manufacturing

This certified reference material 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 analytical procedures. Every certified value is the result of multiple independent analyses.

Homogeneity

Homogeneity testing is performed by means of spark optical 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 1% - 3% for the elements Si, Fe, Cu, Mg, Cr, Ni, Zn, Ag, Be, Cd, Ce, Co, Mo, Pb, Sn and Sc and 4% - 15% for the trace elements As, B, Ba, Bi, Ca, Ga, Hg, In, La, Li, Mn, Na, P, Sb, Sr, V, W, and Zr. The homogeneity within one sample and between discs (cast homogeneity) is considered in the calculation of the uncertainty of the certified value.

Description of Sample

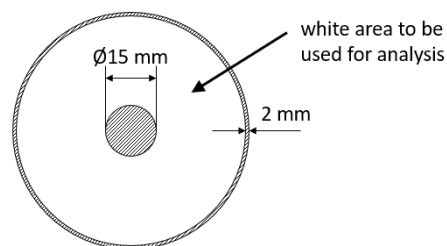
This reference material is available in the form of discs (approx. 60mm diameter and 25mm height).

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. It may be used for instrument calibration, validation of analytical methods and drift correction over time. The material will remain stable for the period given below (certificate validity) if it is stored in a dry (non-condensing) and clean environment at room temperature ($\leq 40^\circ\text{C}$).

Instructions for Use

Measurements should be made within a ring (see white area in the picture). For wet chemical analysis chips have to be prepared by turning or milling of the sample surface. The minimum mass to be used is 0.2 g. For spark OES analysis, the surface of the material needs to be prepared by milling. The minimum area to be analyzed for spark OES and XRF analysis is 30 mm².



Traceability

Traceability of the certified mass fractions to the SI (Système International d'Unités) is ensured by calibration using certified standard solutions.

Accreditation

Suisse Technology Partners Ltd. is accredited as a producer of reference materials and certified reference materials according to ISO 17034 (SRMS 0006). This material was produced according to the rules of ISO 17034 and analyzed in our own laboratories accredited according to ISO/IEC 17025 (STS 0023). This material is an accredited certified reference material according to ISO 17034 (SRMS 0006).

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This certificate
can be downloaded
here: <https://refmat.ch/117-05>

