Reference Material Certificate



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	Mass fraction 1) in [%]	Uncertainty ²⁾ in mass fraction [%]	
for certification				
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 0.0010	0.0001	
	Manganese (Mn) a, b, c, d		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)	muth (Bi) b, c, d, e		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 0.000	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

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.

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		Abbreviations	
а	ICP-OES, digestion with caustic soda	ICP-OES	Inductively coupled plasma -
b	ICP-OES, digestion with acid	ICP-OES	optical emission spectrometry
С	ICP-OES, closed vessel digestion with acid	ICP-MS	Inductively coupled plasma -
d	ICP-MS, digestion with acid	ICP-1413	mass spectrometry
е	ICP-MS, closed vessel digestion with acid	FAAS	Flame atomic absorption
f	FAAS, digestion with acid	FAAS	spectrometry
g	Spark OES, solid sample analysis	CV-AAS	Cold vapor atomic absorption
h	Spectrophotometry, digestion with caustic soda	CV-AA3	spectrometry
i	Spectrophotometry, digestion with acid	Spark	Spark optical emission
k	CV-AAS, closed vessel digestion with acid	OES	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

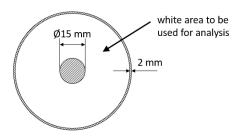
This reference material is available in the form of discs (approx. 60mm diameter and 25mm height).

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 °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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