Reference Material Certificate

136/03

Aluminium Base (Type of Standard)
Al 99.8 – 99.3, Set 130

Certified Values

Element	Analytical Methods used for Certification	Mass content [1] in [%]	Uncertainty [2] in [%]
Silicon (Si)	a, f	0.294	0.022
Iron (Fe)	a, b, c, f, g	0.365	0.011
Copper (Cu)	a, b, c, d, e, g	0.056	0.001
Manganese (Mn)	a, b, c, d	0.058	0.001
Magnesium (Mg)	a, b, c, d, e, g	0.038	0.001
Chromium (Cr)	a, b, c, d, e, g	0.037	0.001
Nickel (Ni)	a, b, c, d, e	0.032	0.001
Zinc (Zn)	a, b, c, d, e, g	0.034	0.001
Titanium (Ti)	a, b, c, d, e, f, g	0.030	0.002
Boron (B)	b, d	0.0002	0.0001
Beryllium (Be)	b, c, d, e	0.00019	0.00002
Bismuth (Bi)	b, e	0.0002	0.0001
Calcium (Ca)	b	(0.0002)	
Cadmium (Cd)	b, c, d, e, g	< 0.0001	
Cobalt (Co)	b, c, d, e	0.0005	0.0001
Gallium (Ga)	a, b, c, d, e	0.030	0.001
Lithium (Li)	c, d, e	0.00003	0.00001
Sodium (Na)	b, b, g	0.0009	0.0002
Phosphorus (P)	c, d	0.0009	0.0003
Lead (Pb)	b, c, d, e	0.0010	0.0002
Antimony (Sb)	c, d, e	0.0016	0.0002
Tin (Sn)	b, d, e	0.0003	0.0001
Strontium (Sr)	b, c, d, e	< 0.0001	
Vanadium (V)	a, b, c, e, g	0.025	0.001
Zirconium (Zr)	b, c, d, e	0.0098	0.0004

[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 x S_M / √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.

Values in brackets ( ) are not certified but given for information only.

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

Abbreviations:

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

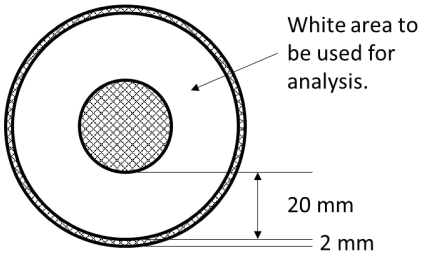
Manufacturing
This certified reference material is produced by vertical continuous casting of a single ingot out of a single melt followed by extrusion using a single strand dye to final diameter.

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. 65 mm diameter and 25 mm 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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Date of certification: 11-Nov-2020
Certificate version 002: 12-Jan-2022
This certificate is valid until: Nov-2095