

Certified Reference Material

Certificate of Analysis

Product ID: MBH-AL6351-20

ISO
17034:2016

ISO/IEC
17025:2017

ISO
9001:2015

Product Description: Aluminum Alloy, AA6351 / UNS A96351

Revision No.: 000
Revision Date: 04/06/2022

Description and Intended Use: This **Certified Reference Material** is covered under the scope of accreditation to **ISO 17034** by LGC Standards - Manchester, NH. As an ISO 17034 certified reference material, appropriate use of this material will fulfill the certified reference material and traceability requirements for use in **ISO 17025** accredited laboratories. This CRM may come in the form of a solid disk, or chips. The intended use of this CRM may include, but is not limited to, the calibration of instruments and the validation of analytical methods.

Certified Values listed in wt.% with associated uncertainties

Co	0.00039 ± 0.00008	Cr	0.186 ± 0.008	Cu	0.044 ± 0.003	Fe	0.227 ± 0.009
Ga	0.007 ± 0.001	Mg	0.56 ± 0.02	Mn	0.61 ± 0.01	Ni	0.018 ± 0.002
Pb	0.0008 ± 0.0003	Si	1.00 ± 0.02	Sn	0.0060 ± 0.0009	Ti	0.100 ± 0.003
V	0.019 ± 0.001	Zn	0.16 ± 0.01	Zr	0.45 ± 0.03		

Indicative Values listed in ppm

Ag (7)	Al (96.8%)	B (10)	Be (3.9)	Bi (1)	S (40)	Sb (50)
Sr (10)	Y (1)					

Homogeneity and Uncertainty: "Uncertainty" values, as reported adjacent to certified concentration values, are based on a 95% Confidence Interval. These estimated uncertainties include the combined effects of method imprecision, material inhomogeneity, and any bias between methods. Homogeneity data from experimental XRF results are reflected in both the overall statistics and certified data. Homogeneity samples are selected by a systematic sampling procedure. The number of samples may be determined by equation 1, where N_{prod} is the number of units produced and N_{min} is the number of samples used for homogeneity testing. These samples are arranged in a simple randomized design such that each sample is analyzed multiple times by XRF. Homogeneity may also be determined within sample using an applied version of ASTM E826. A single factor ANOVA is used to calculate uncertainty due to inhomogeneity (U_{hom}). Uncertainty of the material is calculated by equation 2, where $H=U_{hom}$, S = Standard deviation, t = t-value at 95% CI, and n = number of observations.

$$1. N_{MIN} = \max(10, \sqrt[3]{N_{PROD}})$$

$$2. U_{CRM} = \frac{\sqrt{H^2 + S^2}}{\sqrt{n}} * t$$

Certification Laboratories: Much of the analytical work performed to assess this material has been carried out by laboratories with proven competence, as indicated by their accreditation to ISO 17025. It is an implicit requirement for this accreditation that analytical work should be performed with due traceability, via an unbroken chain of comparisons, each with stated uncertainty, to primary standards such as the mole, or to nationally- or internationally-recognized reference materials. Of the individual results herein, some have traceability (to the mole) via primary analytical methods. Some are traceable to substances of known stoichiometry. Most have traceability via commercial solutions. Furthermore, some results have additional traceability to NIST standards, as part of the analytical calibration or process control.

- LGC Standards - Manchester, NH
- Lucid Laboratories - Telangana, India
- NSL Analytical Services - Cleveland, OH
- SGS MSI - Melrose Park, IL
- AnchorCert Analytical - Birmingham, UK
- New Hampshire Materials Laboratory - Somersworth, NH
- Scrooby's Laboratory Services - Benoni, South Africa
- IMR Test Labs - Louisville, KY
- TEC Eurolab - Campogalliano, Italy
- Universal Scientific Laboratory - Revesby, Australia
- Applied Technical Services - Marietta, GA
- Dirats Laboratories - Westfield, MA
- Genitest Inc. - Montreal, Canada
- Laboratory Testing, Inc. - Hatfield, PA

Instructions for Use: The test surface is on the opposite side of the labeled surface, which includes the material identification. The entire thickness of the unit is certified. However, the user is cautioned not to measure disks less than 2 mm thick when using X-ray fluorescence spectrometry. Each packaged disk has been prepared by finishing the test surface using a lathe. The user must determine the correct surface preparation procedure for each analytical technique. The user is cautioned to use care when either resurfacing the disk or performing additional polishing, as these processes may contaminate the surface. The minimum sample size for chips should be individually evaluated based on the analytical technique used; this would typically be greater than 0.1 grams. The material should be stored in a cool, dry location when not in use.

Chips are not recommended for gas analysis.

Period of Validity: The certification of this material is valid indefinitely, within the uncertainty specified, provided the material is handled and stored in accordance with the instructions stated on this certificate. The certification is nullified if the material is damaged, contaminated, otherwise modified, or used in a manner for which it was not intended.


Kimberly Halkotis, Global Product Manager

April 06, 2022
Certification Date



ISO 17034 Accredited: Reference Materials
Producer, Certificate # 2848.02
ISO/IEC 17025 Accredited: Chemical
Testing, Certificate # 2848.01

Conditions of Sale and Supply: All CRMs & RMs sold are subject to applicable LGC Standard Terms and Conditions of Sale.



The following data represents all pertinent information reported as it applies to the chemical characterization of this material.

	Ag	Al	B	Be	Bi	Co	Cr	Cu	Fe	Ga	Mg	Mn	Ni
1	0.0002	96.460	0.0008	0.0004	0.0001	0.0002	0.1510	0.0338	0.1903	0.0043	0.5000	0.5409	0.0130
2	0.0006	96.550	0.0020	0.0004	0.0001	0.0003	0.1610	0.0366	0.1970	0.0050	0.5000	0.5700	0.0132
3	0.0010	96.600		0.0004	<0.001	0.0004	0.1710	0.0390	0.1991	0.0050	0.5102	0.5710	0.0140
4	0.0010	96.900		0.0004		0.0004	0.1775	0.0400	0.2080	0.0058	0.5136	0.5933	0.0140
5		97.300				0.0004	0.1800	0.0400	0.2090	0.0060	0.5160	0.5950	0.0144
6						0.0004	0.1820	0.0404	0.2213	0.0066	0.5240	0.5970	0.0150
7						0.0005	0.1830	0.0404	0.2250	0.0069	0.5300	0.6050	0.0153
8						0.0005	0.1840	0.0410	0.2300	0.0070	0.5310	0.6100	0.0158
9						<0.0005	0.1847	0.0411	0.2316	0.0076	0.5374	0.6120	0.0160
10						<0.0005	0.1860	0.0435	0.2345	0.0090	0.5597	0.6159	0.0170
11						<0.0005	0.1879	0.0435	0.2350	0.0098	0.5603	0.6180	0.0170
12						<0.001	0.1920	0.0444	0.2360	0.0116	0.5700	0.6203	0.0171
13						<0.0010	0.1939	0.0448	0.2371		0.5730	0.6283	0.0180
14						<0.01	0.1960	0.0457	0.2387		0.5800	0.6291	0.0185
15						<0.01	0.2000	0.0480	0.2400		0.5839	0.6340	0.0194
16							0.2010	0.0487	0.2400		0.5850	0.6370	0.0230
17							0.2100	0.0500	0.2410		0.5990	0.6440	0.0271
18							0.2103	0.0520	0.2450		0.6176	0.6586	0.0280
19								0.0585	0.2600		0.6670		
Mean	0.0007	96.762	0.0014	0.0004	0.0001	0.0004	0.1862	0.0438	0.2273	0.0071	0.5557	0.6100	0.0175
STDV	0.0004	0.3431	0.0009	0.00003	0.0000	0.0001	0.0153	0.0058	0.0185	0.0022	0.0442	0.0290	0.0044
Certified	(0.0007)	(96.8)	(0.001)	(0.00039)	(0.0001)	0.00039	0.186	0.044	0.227	0.007	0.56	0.61	0.018
U _{CRM}						0.00008	0.008	0.003	0.009	0.001	0.02	0.01	0.002
Methods	I,O	I,O,X	I	I,O	I,O	I,IM,O,X,G	I,O,X,G,IM	I,O,X,G,IM	I,O,X,G,IM	I,IM,O,X,G	I,O,X,G	I,O,X,G	I,IM,O,X,G

	Pb	S	Sb	Si	Sn	Sr	Ti	V	Y	Zn	Zr
1	0.0003	0.0003	0.0040	0.9300	0.0046	0.0001	0.0851	0.0146	0.0001	0.1240	0.3680
2	0.0004	0.0009	0.0062	0.9688	0.0046	0.0002	0.0913	0.0154	<0.0001	0.1300	0.4164
3	0.0006	0.0027		0.9760	0.0050	0.0002	0.0940	0.0170	<0.0001	0.1386	0.4320
4	0.0009	0.0052		0.9800	0.0053	0.0002	0.0964	0.0170	<0.0002	0.1390	0.4390
5	0.0010	0.0062		0.9970	0.0057	0.0020	0.0970	0.0177	<0.001	0.1463	0.4500
6	0.0010	0.0073		1.0030	0.0057	<0.0001	0.0982	0.0177	<0.0010	0.1510	0.4532
7	0.0011	<0.0001		1.0120	0.0063	<0.0002	0.0988	0.0180		0.1520	0.4568
8	0.0014	<0.005		1.0120	0.0066	<0.0005	0.0993	0.0182		0.1530	0.4575
9	<0.0005	<0.005		1.0180	0.0067	<0.0005	0.0999	0.0185		0.1570	0.4650
10	<0.0005			1.0280	0.0090	<0.0005	0.1000	0.0190		0.1570	0.4726
11	<0.0005			1.0300	<0.005	<0.0010	0.1010	0.0194		0.1574	0.5485
12	<0.001			1.0511	<0.005	<0.01	0.1020	0.0200		0.1580	
13	<0.0010			1.0526	<0.005		0.1030	0.0200		0.1710	
14							0.1030	0.0203		0.1740	
15							0.1039	0.0204		0.1750	
16							0.1040	0.0220		0.1750	
17							0.1063	0.0233		0.1858	
18							0.1090	0.0234		0.2055	
19							0.1100				
Mean	0.0008	0.0038	0.0051	1.0045	0.0060	0.0005	0.1001	0.0190	0.0001	0.1583	0.4508
STDV	0.0004	0.0029	0.0016	0.0345	0.0013	0.0008	0.0059	0.0024		0.0202	0.0434
Certified	0.0008	(0.004)	(0.005)	1.00	0.0060	(0.001)	0.100	0.019	(0.0001)	0.16	0.45
U _{CRM}	0.0003			0.02	0.0009		0.003	0.001		0.01	0.03
Methods	I,IM,O,X	I,C,X	I	I,X,W,G	I,IM,X,O	I,O,IM,X	I,O,X,G,IM	I,IM,O,X,G	I,IM	I,O,X,IM	I,X,O,IM

Legend: W = Classical, C = Combustion, F = Fusion, A = AA or GFAA, I = ICP or DCP, IM=ICP-MS, D = DC Arc, O = AES, X = XRF, G = GDAES or GDMS, H = Hollow Cathode AES

