

Certified Reference Material **Certificate of Analysis**

Product ID: MBH-AL6061-19

ISO
17034:2016

ISO/IEC
17025:2017

ISO
9001:2015

Product Description: Aluminum Alloy, AA6061 / A96061

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											
Bi	0.007	± 0.001	Cd	0.0012	± 0.0001	Cr	0.254	± 0.006	Cu	0.247	± 0.004
Fe	0.400	± 0.009	Ga	0.0064	± 0.0009	Mg	0.896	± 0.009	Mn	0.106	± 0.002
Ni	0.058	± 0.002	Pb	0.090	± 0.006	Sb	0.0023	± 0.0008	Si	0.71	± 0.03
Sr	0.0069	± 0.0003	Ti	0.055	± 0.002	V	0.028	± 0.002	Zn	0.101	± 0.003
Zr	0.0034	± 0.0006									

Indicative Values listed in ppm							
Ag (10)	Al (97.1%)	As (<10)	B (10)	Be (5)	Ca (20)	Co (<2)	
Na (<6)	P (100)	S (<5)	Sn (30)				

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
- RSML - Bengaluru, India
- NSL Analytical Services - Cleveland, OH
- Laboratory Testing, Inc. - Hatfield, PA
- Connecticut Metallurgical, Inc. - East Hartford, CT
- IMR Test Labs - Lansing, NY
- SGS MSI - Melrose Park, IL
- Scrooby's Laboratory Service - Rynfield, South Africa
- Applied Technical Services - Marietta, GA
- EAG Laboratories - Liverpool, NY
- AnchorCert Analytical - Birmingham, UK
- Luvac Inc. - Boylston, MA

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

October 7, 2021
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	As	B	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Mg
1	0.0001	96.900	0.0002	0.0004	0.0003	0.0030	0.0005	0.0010	0.0001	0.2390	0.2380	0.3741	0.0046	0.8810
2	0.0001	97.000	0.0010	0.0005	0.0005	0.0040	0.0008	0.0010	0.0002	0.2427	0.2418	0.3860	0.0048	0.8820
3	0.0005	97.109	<0.001	0.0007	0.0005	0.0050	0.0008	0.0010	0.0003	0.2429	0.2430	0.3863	0.0050	0.8820
4	0.0033	97.120	<0.001	0.0012	0.0005	0.0056	0.0010	0.0010	<0.0001	0.2440	0.2430	0.3910	0.0055	0.8852
5	<0.0001	97.130	<0.001	0.0016	0.0007	0.0056	0.0016	0.0011	<0.0005	0.2493	0.2432	0.3910	0.0056	0.8879
6	<0.0005			0.0033	<0.0001	0.0056	0.0020	0.0012	<0.0005	0.2500	0.2441	0.4000	0.0060	0.8898
7	<0.001			<0.0001	<0.0005	0.0060	0.0050	0.0012	<0.001	0.2520	0.2450	0.4010	0.0065	0.8900
8				<0.0001	<0.001	0.0060	<0.02	0.0013	<0.001	0.2520	0.2450	0.4020	0.0070	0.8945
9				<0.001	<0.001	0.0078		0.0013		0.2546	0.2460	0.4023	0.0077	0.9010
10						0.0082		0.0014		0.2560	0.2500	0.4080	0.0079	0.9030
11						0.0086		0.0014		0.2600	0.2510	0.4152	0.0080	0.9030
12						0.0090		0.0017		0.2615	0.2533	0.4186	0.0085	0.9040
13						0.0102				0.2634	0.2566	0.4230	<0.005	0.9070
14						0.0120				0.2670	0.2636			0.9140
15										0.2750				0.9145
16														
17														
18														
19														
20														
Mean	0.0010	97.052	0.0006	0.0013	0.0005	0.0069	0.0017	0.0012	0.0002	0.2540	0.2474	0.3999	0.0064	0.8959
STDV	0.0015	0.0997	0.0006	0.0011	0.0001	0.0025	0.0016	0.0002	0.0001	0.0101	0.0068	0.0141	0.0014	0.0115
Certified	(0.001)	(97.1)	(<0.001)	(0.001)	(0.0005)	0.007	(0.002)	0.0012	(<0.0002)	0.254	0.247	0.400	0.0064	0.896
U _{CRM}						0.001		0.0001		0.006	0.004	0.009	0.0009	0.009
Methods	O,IM,I	O,I	O,I,IM,I	O,IM,I	O,IM,I	O,I,IM	O,I	O,I,IM	O,IM,I	O,I,IM,X	O,I,X	O,I,X	O,IM,I,X	O,I,X

	Mn	Na	Ni	P	Pb	S	Sb	Si	Sn	Sr	Ti	V	Zn	Zr
1	0.0980	0.0003	0.0520	0.0010	0.0740	0.0002	0.0012	0.6338	0.0004	0.0062	0.0506	0.0227	0.0900	0.0017
2	0.0990	0.0008	0.0540	0.0015	0.0770	<0.0001	0.0018	0.6410	0.0007	0.0064	0.0510	0.0236	0.0920	0.0020
3	0.1019	0.0008	0.0549	0.0024	0.0770	<0.0005	0.0020	0.6487	0.0009	0.0066	0.0510	0.0245	0.0950	0.0025
4	0.1030	<0.0001	0.0550	0.0170	0.0840	<0.001	0.0021	0.6780	0.0010	0.0068	0.0530	0.0260	0.0970	0.0030
5	0.1037	<0.0005	0.0554	<0.002	0.0855		0.0023	0.6840	0.0011	0.0068	0.0544	0.0260	0.0973	0.0032
6	0.1040	<0.001	0.0560	<0.002	0.0877		0.0030	0.7096	0.0022	0.0070	0.0550	0.0275	0.1005	0.0035
7	0.1046	<0.005	0.0570		0.0930		0.0040	0.7100	0.0040	0.0070	0.0551	0.0277	0.1010	0.0035
8	0.1060		0.0570		0.0937		<0.002	0.7130	0.0048	0.0070	0.0551	0.0278	0.1020	0.0038
9	0.1061		0.0580		0.0959			0.7310	0.0050	0.0074	0.0551	0.0280	0.1021	0.0040
10	0.1070		0.0590		0.0965			0.7416	0.0107	0.0079	0.0556	0.0289	0.1040	0.0041
11	0.1070		0.0609		0.0990			0.7426	<0.0005	<0.01	0.0560	0.0293	0.1041	0.0043
12	0.1077		0.0618		0.0997			0.7430	<0.001		0.0577	0.0312	0.1051	0.0049
13	0.1080		0.0627		0.1005			0.7560	<0.001		0.0580	0.0330	0.1063	
14	0.1100		0.0650					0.7730	<0.005		0.0600	0.0333	0.1070	
15	0.1126		0.0654									0.0345	0.1088	
16	0.1147													
17														
18														
19														
20														
Mean	0.1058	0.0006	0.0583	0.0055	0.0895	0.0002	0.0023	0.7075	0.0031	0.0069	0.0548	0.0283	0.1008	0.0034
STDV	0.0044	0.0003	0.0041	0.0077	0.0093		0.0009	0.0444	0.0032	0.0005	0.0027	0.0035	0.0055	0.0010
Certified	0.106	(<0.0006)	0.058	(0.01)	0.090	(<0.0005)	0.0023	0.71	(0.003)	0.0069	0.055	0.028	0.101	0.0034
U _{CRM}	0.002		0.002		0.006		0.0008	0.03		0.0003	0.002	0.002	0.003	0.0006
Methods	O,I,IM,X	O,IM,I	O,I,IM,X	O,I	O,IM,I,X	O,C	O,IM,I	O,I	O,I,IM,X	O,IM,I,X	O,IM,I,X	O,I,IM,X	O,I,IM,X	O,IM,I,X

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

