ARMI | MBH
ANALYTICAL LTD
ISO Certified · 9001 · 17025 · 17043 · 17034

Certificate of Analysis
IARM CuH130-18

Copper Alloy / Hiduron 130 (Hidurax Special)
Certified Reference Material

Certified Values listed in wt.% with associated uncertainties

Al	2.76 ± 0.06	**C**	0.006 ± 0.002	**Co**	0.0037 ± 0.0008	**Cr**	0.002 ± 0.001
Cu	80.9 ± 0.6	**Fe**	0.84 ± 0.04	**Mg**	0.013 ± 0.008	**Mn**	0.449 ± 0.009
Ni	14.6 ± 0.4	**P**	0.004 ± 0.003	**Se**	0.0014 ± 0.0007	**Si**	0.024 ± 0.003
Zn	0.0015 ± 0.0005						

Indicative Values listed in ppm

Ag (10)	As (60)	B (9)	Bi (20)	Cd (30)	H (<10)	Mo (<50)
N (6)	Nb (<50)	O (6)	Pb (20)	S (10)	Sb (30)	Sn (10)
Ta (<10)	Ti (10)	V (<50)	W (<10)	Zr (8)		

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** certified laboratories. This CRM may come in the form of a solid disk, chips, or powder. The intended use of this CRM may include, but is not limited to, the calibration of instruments and the validation of analytical methods.

Instructions for Use

1. 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.
2. 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.
3. The material should be stored in a cool, dry location when not in use.
4. Chips are not recommended for gas analysis.

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

	Al	C	Co	Cr	Cu	Fe	Mg	Mn	Ni	P	Se	Si	Zn	Ag	As	B
1	2.649	0.0032	0.0024	0.0005	79.93	0.788	0.006	0.43	13.5779	0.00012	0.0002	0.01754	0.0009	0.00084	0.0006	0.00078
2	2.674	0.00396	0.003	0.001	80.60	0.7889	0.008	0.433	13.99	0.001	0.001	0.0181	0.001	0.001	0.00546	0.0008
3	2.689	0.004	0.0031	0.0012	80.871	0.794	0.0082	0.4352	14.122	0.0012	0.0017	0.0193	0.0014	<0.001	0.009	0.001
4	2.69	0.0041	0.00329	0.00124	80.949	0.80	0.0086	0.44	14.53	0.002	0.00174	0.0202	0.00141		0.01	<0.001
5	2.77	0.0052	0.0033	0.00125	81.26	0.8267	0.0093	0.444	14.603	0.0031	0.002	0.0207	0.002		<0.001	<0.005
6	2.788	0.006	0.00332	0.0019	81.45	0.83	0.00976	0.4534	14.70	0.00411	0.002	0.022	0.0021		<0.005	
7	2.79	0.00911	0.0037	0.002	81.56	0.831	0.0112	0.4587	14.793	0.006		0.0228				
8	2.793	0.01	0.004	0.00411		0.837	0.02607	0.46	14.81	0.009		0.024				
9	2.80		0.005			0.841	0.03	0.46	15.11			0.026				
10	2.877		0.00583			0.8484		0.46079	15.146			0.029				
11	2.90					0.8562		0.464	15.29			0.02901				
12						0.8686		0.47919	15.671			0.032				
13						0.946										
14						0.981										
15																
Mean	2.77	0.006	0.0037	0.0017	80.9	0.85	0.013	0.45	14.7	0.003	0.0014	0.023	0.0015	0.0010	0.006	0.0009
STDV.	0.08	0.003	0.001	0.001	0.6	0.06	0.009	0.01	0.6	0.003	0.0007	0.005	0.0005	0.0001	0.004	0.0001
Certified	**2.77**	**0.006**	**0.0037**	**0.0017**	**80.9**	**0.85**	**0.013**	**0.45**	**14.7**	**0.003**	**0.0014**	**0.023**	**0.0015**	**(0.001)**	**(0.006)**	**(0.0009)**
U_CRM	0.05	0.002	0.0007	0.0009	0.5	0.04	0.007	0.01	0.4	0.002	0.0007	0.007	0.0005			
Methods	G,O,I,X	C,O	G,O,I,IM,X	O,I,IM,X	W,I,X	G,O,X,I	O,I,IM	G,O,X,I	G,O,I,X	O,IM,I,X	G,O,IM,I,X	G,O,I,IM,X	O,I,IM	O,I	G,I,IM,X	O,IM,I

	Bi	Cd	H	Mo	N	Nb	O	Pb	S	Sb	Sn	Ta	Ti	V	W	Zr
1	0.0001	0.001	0.0001	0.005	0.0003	0.001	0.0002	0.0002	0.00004	0.0003	0.00022	<0.001	0.0003	0.0002	<0.001	0.0005
2	0.0003	0.0019	0.0001	<0.001	0.0004	<0.001	0.0005	0.0003	0.0003	0.001	0.0003	<0.001	0.00059	<0.001	<0.001	0.00098
3	0.00044	0.006	<0.001	<0.005	0.001	<0.001	0.0006	0.0016	0.0004	0.0015	0.001		0.001	<0.001		0.001
4	0.004	<0.001		<0.0005	<0.0005	<0.005	0.001	0.0019	0.0012	0.0056	0.0013		0.003	<0.005		<0.001
5	0.004	<0.001		<0.001	<0.001		<0.0005	0.005	0.002	0.00605	0.0018		<0.005			<0.005
6	0.005	<0.005			<0.001		<0.001	<0.001	0.00215	<0.001	0.00272					
7	<0.001						<0.001	<0.001	<0.0005	<0.001	<0.001					
8	<0.005							<0.005	<0.001	<0.005	<0.001					
9											<0.005					
10																
11																
12																
13																
14																
15																
Mean	0.002	0.003			0.0006		0.0006	0.002	0.0010	0.003	0.0010		0.001			0.0008
STDV.	0.002	0.003			0.0004		0.0004	0.002	0.0009	0.003	0.0009		0.001			0.0003
Reference	**(0.002)**	**(0.003)**	**(<0.001)**	**(<0.005)**	**(0.0006)**	**(<0.005)**	**(0.0006)**	**(0.002)**	**(0.001)**	**(0.003)**	**(0.001)**	**(<0.001)**	**(0.001)**	**(<0.005)**	**(<0.001)**	**(0.0008)**
Methods	O,I,IM,X	O,IM,I,X	F	IM,I	F	O,IM,I	F	O,I,IM	C,O	G,O,I,IM,X	O,I,IM,X	IM,I	IM,I	IM,I	IM,I	IM,I

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

Certification Laboratories

Langley Alloys, Inc.	Vancouver, WA	LECO Corporation	St. Joseph, MI
AY Mc Donald Mfg. Co.	Dubuque, IA	Anderson Laboratories, Inc.	Greendale, WI
Colonial Metals Co.	Columbia, PA	Laboratory Testing, Inc.	Hatfield, PA
NSL Analytical Services	Cleveland, OH	IMR Test Labs	Lansing, NY
Dirats Laboratories	Westfield, MA	Applied Technical Services	Marietta, GA
EAG Laboratories	Liverpool, NY	LGC Standards	Manchester, NH

Certification laboratories have demonstrated performance and traceability by utilizing a variety of test methods under the scope of ISO 17025 or have demonstrated equivalent performance. Some of the specific CRMs and SRMs used in the analysis of the material covered by this certificate are:

IARM 226A   IARM 267A   IARM 87B   LECO 501-147   LECO 501-402   MBH 34XNS3-C   MBH 36XCN11A   MBH 36XCN13A   MBH 36XCN2J   NIST 1124
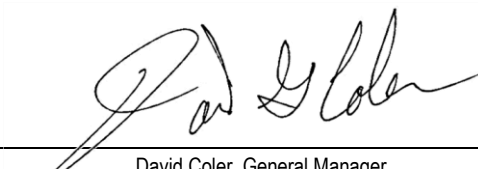
Homogeneity and Uncertainty

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

Expiration

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.

David Coler, General Manager

Analytical Reference Materials International

ACCREDITED