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Certified Reference Material | Certificate of Analysis

ISO 17034:2016 **ISO/IEC 17025:2017** **ISO 9001:2015**

Product ID: IARM-COMP35N-18

Product Description: Cobalt Alloy, MP35N / R30035

Revision No.: 000
Revision Date: 05/05/2022

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

Al	0.060	± 0.004	B	0.009	± 0.001	C	0.0049	± 0.0009	Co	32.7	± 0.2
Cr	19.9	± 0.1	Fe	0.031	± 0.004	Mn	0.002	± 0.001	Mo	10.1	± 0.1
N	0.0018	± 0.0003	Ni	36.53	± 0.09	P	0.0022	± 0.0005	S	0.0013	± 0.0006
Si	0.012	± 0.004	Ti	0.78	± 0.01	V	0.006	± 0.001	Zr	0.002	± 0.001

Indicative Values listed in ppm

Cu (50)   Nb (60)   Ta (60)   W (60)

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.

$$1.\, N_{MIN} = \max\left(10, \sqrt[3]{N_{PROD}}\right) \qquad\qquad 2.\, U_{CRM} = \frac{\sqrt{H^2 + S^2}}{\sqrt{n}} * t$$

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-recognised 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
- Connecticut Metallurgical, Inc. - East Hartford, CT
- Dirats Laboratories - Westfield, MA
- IMR Test Labs - Lansing, NY
- Laboratory Testing, Inc. - Hatfield, PA
- NSL Analytical Services - Cleveland, OH
- SGS MSi - Melrose Park, IL
- EAG Laboratories - Liverpool, NY
- Instytut Metalurgii Żelaza - Gliwice, Poland
- Sheffield Assay Office - Sheffield, England
- TCR Engineering Services - Maharashtra, India
- TEC Eurolab - Campogalliano, Italy
- Lucid Laboratories Pvt. Ltd. - Telangana, India
- New Hampshire Materials Laboratory - Somersworth, NH
- Applied Technical Services - Marietta, GA

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 Halkiotis, Global Product Manager

<u>May 05, 2022</u>
Certification Date

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

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

	Al	B	C	Co	Cr	Cu	Fe	Mn	Mo	N	Nb	Ni	P
1	0.0519	0.0061	0.0029	32.224	19.550	0.0007	0.0232	0.0004	9.7680	0.0006	0.0005	36.419	0.0015
2	0.0530	0.0071	0.0030	32.348	19.560	0.0009	0.0240	0.0004	9.8170	0.0013	0.0014	36.420	0.0015
3	0.0550	0.0077	0.0035	32.380	19.730	0.0017	0.0280	0.0006	9.9200	0.0014	0.0015	36.470	0.0015
4	0.0563	0.0078	0.0037	32.540	19.870	0.0028	0.0299	0.0008	10.027	0.0017	0.0017	36.470	0.0015
5	0.0568	0.0081	0.0040	32.560	19.873	0.0040	0.0300	0.0020	10.040	0.0017	0.0020	36.489	0.0020
6	0.0571	0.0081	0.0040	32.600	19.890	0.0049	0.0338	0.0029	10.080	0.0020	0.0070	36.510	0.0020
7	0.0640	0.0090	0.0042	32.620	19.890	0.0060	0.0339	0.0042	10.090	0.0020	0.0110	36.640	0.0021
8	0.0647	0.0093	0.0043	32.660	19.941	0.0070	0.0354	0.0043	10.110	0.0020	0.0112	36.650	0.0024
9	0.0654	0.0097	0.0047	32.670	19.987	0.0096	0.0360	<0.0010	10.126	0.0020	0.0169	36.730	0.0025
10	0.0668	0.0100	0.0054	32.840	20.010	0.0100	0.0378	<0.005	10.140	0.0021	<0.0010		0.0027
11	0.0697	0.0114	0.0056	32.920	20.054	<0.001		<0.005	10.162	0.0025			0.0040
12		0.0120	0.0057	33.050	20.080	<0.0010		<0.01	10.162	<0.001			<0.001
13			0.0062	33.067	20.119				10.220				<0.0010
14			0.0071		20.310				10.320				<0.002
15			0.0087		20.347				10.490				<0.005
16			<0.0050						10.733				<0.0050
Mean	0.0601	0.0089	0.0049	32.652	19.947	0.0048	0.0312	0.0020	10.138	0.0018	0.0059	36.533	0.0022
STDV	0.0062	0.0017	0.0016	0.2601	0.2280	0.0034	0.0050	0.0017	0.2359	0.0005	0.0059	0.1119	0.0008
Certified	**0.060**	**0.009**	**0.0049**	**32.7**	**19.9**	**(0.005)**	**0.031**	**0.002**	**10.1**	**0.0018**	**(0.006)**	**36.53**	**0.0022**
U$_{CRM}$	0.004	0.001	0.0009	0.2	0.1		0.004	0.001	0.1	0.0003		0.09	0.0005
Methods	I,IM,X,O	I,IM,O	C,O	I,X,O	I,W,X,O	I,IM,X,O	I,IM,X	I,IM,O,X	I,X,O	F,W,C	IM,I,O,X	I,W,X,O	I,IM,X,W,O

	S	Si	Ta	Ti	V	W	Zr
1	0.0004	0.0060	0.0007	0.7601	0.0042	0.0015	0.0002
2	0.0005	0.0070	0.0043	0.7604	0.0044	0.0020	0.0006
3	0.0007	0.0091	0.0048	0.7610	0.0055	0.0022	0.0012
4	0.0007	0.0094	0.0050	0.7700	0.0059	0.0022	0.0018
5	0.0009	0.0116	0.0062	0.7702	0.0060	0.0027	0.0020
6	0.0010	0.0121	0.0075	0.7720	0.0069	0.0041	0.0035
7	0.0010	0.0146	0.0151	0.7790	0.0069	0.0050	<0.001
8	0.0011	0.0175	<0.0001	0.7840	<0.001	0.0073	<0.001
9	0.0013	0.0193	<0.001	0.7850	<0.0010	0.0130	<0.0010
10	0.0016		<0.001	0.7870	<0.005	0.0153	<0.002
11	0.0020		<0.0010	0.7925	<0.0050	<0.005	<0.005
12	0.0026		<0.0030	0.7940		<0.01	<0.01
13	0.0030		<0.005	0.8000			
14	<0.001			0.8013			
15	<0.001			0.8059			
16	<0.0010			0.8206			
Mean	0.0013	0.0118	0.0062	0.7839	0.0057	0.0055	0.0016
STDV	0.0008	0.0046	0.0044	0.0178	0.0011	0.0049	0.0012
Certified	**0.0013**	**0.012**	**(0.006)**	**0.78**	**0.006**	**(0.006)**	**0.002**
U$_{CRM}$	0.0006	0.004		0.01	0.001		0.001
Methods	C,O,I,X	I,IM,O,X	I,IM,X	I,X,O	I,IM,X	I,IM,X	I,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

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