

Certificate of Analysis

IARM Ni725-18

Nickel Alloy 725 / UNS N07725

Certified Reference Material

Certified Values listed in wt.% with associated uncertainties

Al	0.22 ± 0.01	B	0.0023 ± 0.0003	C	0.008 ± 0.002	Co	0.077 ± 0.007
Cr	20.5 ± 0.1	Cu	0.103 ± 0.003	Fe	7.47 ± 0.08	Mg	0.005 ± 0.002
Mn	0.076 ± 0.004	Mo	7.9 ± 0.1	N	0.008 ± 0.001	Nb	3.47 ± 0.03
Ni	58.4 ± 0.5	P	0.0047 ± 0.0006	S	0.0008 ± 0.0005	Si	0.084 ± 0.009
Sn	0.0011 ± 0.0009	Ta	0.006 ± 0.005	Ti	1.55 ± 0.03	V	0.013 ± 0.002
W	0.04 ± 0.01						

Indicative Values listed in ppm

As (<20)	Bi (<1)	Ca (<10)	Hf (<102)	O (5)	Pb (<10)	Re (<100)
Sb (<1)	Y (<100)	Zn (<30)	Zr (<50)			

Description and Intended Use

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 certified for Oxygen analysis.

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

	Al	As	B	Bi	C	Ca	Co	Cr	Cu	Fe	Hf	Mg	Mn	Mo	N	Nb
1	0.18	0.002	0.0017	<0.00005	0.0056	0.0007	0.066	20.1381	0.095	7.256	0.00667	0.0017	0.066	7.649	0.0068	3.41
2	0.188		0.002		0.0059	0.001	0.068	20.15	0.098	7.37	0.0102	0.0047	0.067	7.768	0.007	3.412
3	0.21		0.002		0.0065	<0.0005	0.068	20.44	0.103	7.40		0.005	0.07	7.783	0.007	3.419
4	0.216		0.002		0.007		0.0688	20.45	0.103	7.40		0.0054	0.073	7.799	0.00717	3.44
5	0.217		0.0022		0.0072		0.071	20.59	0.103	7.403		0.006	0.076	7.824	0.0088	3.46
6	0.219		0.0022		0.0079		0.072	20.596	0.103	7.436		0.006	0.076	7.843	0.0093	3.475
7	0.219		0.0024		0.0093		0.0745	20.60	0.103	7.517		0.0069	0.0762	7.87		3.48
8	0.22		0.0028		0.01		0.08	20.631	0.106	7.532			0.0771	7.92		3.481
9	0.226		0.003		0.011		0.081	20.64	0.11	7.5925			0.0776	7.96		3.49
10	0.23				0.012		0.085	20.72	0.11	7.60			0.08	8.093		3.506
11	0.2403						0.09	20.74		7.6793			0.081	8.20		3.558
12	0.271						0.0991	20.75					0.091			
13																
14																
15																
Mean	0.22		0.0023		0.008		0.077	20.5	0.103	7.47		0.005	0.076	7.9	0.008	3.47
STDV.	0.02		0.0004		0.002		0.01	0.2	0.005	0.1		0.002	0.007	0.2	0.001	0.04
Certified	0.22	(<0.002)	0.0023	(<0.0001)	0.008	(<0.001)	0.077	20.5	0.103	7.47	(<0.0102)	0.005	0.076	7.9	0.008	3.47
U _{CRM}	0.01		0.0003		0.002		0.007	0.1	0.003	0.08		0.002	0.004	0.1	0.001	0.03
Methods	X,O,IM,I	IM	O,IM,I	IM	C	O,IM	X,O,IM,I	X,W,O,I	X,O,IM,I	X,O,I	O	O,IM,I	X,O,IM,I	X,O,I	F	X,O,I

	Ni	O	P	Pb	Re	S	Sb	Si	Sn	Ta	Ti	V	W	Y	Zn	Zr
1	57.176	0.00014	0.0037	0.00009	0.01	0.0002	0.0001	0.0611	0.00043	0.001	1.451	0.01	0.02	0.01	0.0029	0.00023
2	57.958	0.0003	0.0038	0.001		0.0003		0.0698	0.0005	0.004	1.483	0.0111	0.0236			0.001
3	58.17	0.0006	0.0039	0.0077		0.0004		0.07	0.00055	0.005	1.52	0.012	0.027			0.001
4	58.21	0.001	0.004	<0.00005		0.0005		0.073	0.001	0.0061	1.537	0.0129	0.036			<0.0007
5	58.43	<0.0005	0.0042	<0.005		0.0009		0.075	0.0015	0.0067	1.54	0.013	0.0362			<0.001
6	58.455		0.0046			0.001		0.083	0.0027	0.016	1.543	0.014	0.038			<0.005
7	58.657		0.0046			0.001		0.087			1.55	0.016	0.044			
8	58.84		0.005			0.0012		0.09			1.57	0.016	0.051			
9	58.86		0.0053			0.0021		0.09			1.582	0.016	0.06			
10	59.55		0.006					0.093			1.582		0.0601			
11			0.0063					0.104			1.5875					
12								0.11			1.6668					
13																
14																
15																
Mean	58.4	0.0005	0.0047			0.0008		0.084	0.0011	0.006	1.55	0.013	0.04			0.0010
STDV.	0.6	0.0004	0.0009			0.0006		0.01	0.0009	0.005	0.05	0.002	0.01			0.0004
Certified	58.4	(0.0005)	0.0047	(<0.001)	(<0.01)	0.0008	(<0.0001)	0.084	0.0011	0.006	1.55	0.013	0.04	(<0.01)	(<0.003)	(<0.005)
U _{CRM}	0.5		0.0006			0.0005		0.009	0.0009	0.005	0.03	0.002	0.01			
Methods	X,O,I	F	X,O,IM,I	O,IM	X	X,O,C	IM	X,O,IM,I	O,IM,I	X,O,IM	X,O,I	X,O,IM,I	X,O,IM,I	X	IM	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

Certification Laboratories

Oxford Instruments Analytical GmbH Laboratory Testing, Inc.	Uedem, Germany Hatfield, PA	Huntington Alloys Corporation Latrobe Specialty Metals, A Carpenter Co.	Huntington, WV Latrobe, PA
Davis Alloys Manufacturing, LLC Anderson Laboratories, Inc.	Sharpville, PA Greendale, WI	Laboratorio Prove Materiali S. Marco srl Cronimet Specialty Metals USA, Inc.	Schio, Italy Wheatland, PA
EAG Laboratories VHG Labs	Liverpool, NY Manchester, NH	revierlabor GmbH	Essen, Germany

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

NIST 865 NIST 864 NIST 867 IARM 52B IARM 202A IARM 203A IARM 56D IARM 63B IARM 68C IARM 56F

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.

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

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

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.



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