

Certificate of Analysis

IARM Ni256Mo-18

Nickel Alloy 25-6Mo / UNS N08926

Certified Reference Material

Certified Values listed in wt.% with associated uncertainties

Al	0.17 ± 0.01	B	0.0009 ± 0.0004	C	0.0182 ± 0.0007	Ca	0.0014 ± 0.0005
Co	0.02 ± 0.01	Cr	20.3 ± 0.1	Cu	1.98 ± 0.03	Fe	44.0 ± 0.4
Mn	0.83 ± 0.02	Mo	6.63 ± 0.04	N	0.022 ± 0.002	Nb	0.010 ± 0.005
Ni	25.5 ± 0.1	P	0.004 ± 0.001	S	0.0011 ± 0.0002	Si	0.41 ± 0.01
Ti	0.006 ± 0.002	V	0.009 ± 0.004	W	0.010 ± 0.008		

Indicative Values listed in ppm

As (<20)	Bi (<1)	Hf (<1200)	Mg (92)	O (30)	Pb (<300)	Re (<100)
Sb (<1)	Sn (20)	Ta (<300)	Zr (30)			

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	0.1279	0.0012	0.00026	<0.00005	0.0165	0.0009	0.00086	19.9001	1.929	43.26	0.1198	0.009	0.754	6.53	0.019	0.0006
2	0.15		0.0005		0.017	0.001	0.0037	19.9559	1.949	43.3273		0.009	0.7669	6.544	0.0203	0.0009
3	0.1535		0.0006		0.0175	0.0013	0.0039	20.20	1.9669	43.6041		0.0093	0.824	6.571	0.0207	0.003
4	0.156		0.0006		0.0178	0.0014	0.015	20.23	1.97	43.992		0.0095	0.826	6.602	0.0209	0.004
5	0.16		0.0006		0.018	0.002	0.02	20.248	1.97	44.031			0.834	6.606	0.021	0.0081
6	0.1621		0.001		0.018	0.002	0.0279	20.31	1.98	44.20			0.838	6.629	0.0212	0.01
7	0.17		0.0011		0.0182		0.0295	20.32	1.982	44.523			0.84	6.63	0.0214	0.0122
8	0.17		0.0018		0.0183		0.035	20.321	1.99	44.541			0.84	6.64	0.022	0.0144
9	0.173		0.0019		0.0186		0.047	20.346	2.001	44.743			0.843	6.653	0.0224	0.017
10	0.176				0.0188		0.05	20.38	2.003				0.856	6.722	0.027	0.018
11	0.18				0.02			20.452	2.078				0.86	6.7291		0.02
12	0.182				0.02			20.49					0.896	6.7318		
13	0.188															
14																
15																
Mean	0.17		0.0009		0.0182	0.0014	0.02	20.3	1.98	44		0.0092	0.83	6.63	0.022	0.01
STDV.	0.02		0.0006		0.001	0.0005	0.02	0.2	0.04	0.5		0.0002	0.04	0.07	0.002	0.007
Certified	0.17	(<0.002)	0.0009	(<0.0001)	0.0182	0.0014	0.02	20.3	1.98	44.0	(<0.12)	(0.0092)	0.83	6.63	0.022	0.010
U _{CRM}	0.01		0.0004		0.0007	0.0005	0.01	0.1	0.03	0.4			0.02	0.04	0.002	0.005
Methods	X,O,IM,I,G	IM	X,O,IM,I,G	IM	O,C	O,IM,G	X,O,IM,I	X,W,O,I,G	X,O,I,G	X,O,I,G	O	O,IM	X,O,IM,I,G	X,O,I,G	O,F	X,O,IM,G

	Ni	O	P	Pb	Re	S	Sb	Si	Sn	Ta	Ti	V	W	Zr
1	25.33	0.001	0.0023	0.001	0.01	0.0007	<0.00005	0.39	0.001	0.0064	0.0015	0.001	0.001	0.00014
2	25.365	0.0011	0.0023	0.0204		0.0007		0.396	0.0011	0.007	0.0036	0.0039	0.003	0.001
3	25.37	0.00183	0.0024			0.0008		0.40	0.0022	0.008	0.0037	0.004	0.0063	0.002
4	25.38	0.0019	0.0025			0.0009		0.40	0.003	0.002	0.0042	0.006	0.013	0.002
5	25.387	0.0025	0.003			0.001		0.402		0.03	0.005	0.007	0.014	0.005
6	25.402	0.009	0.003			0.001		0.405			0.006	0.009	0.02	0.0068
7	25.573		0.003			0.001		0.413			0.009	0.01		
8	25.575		0.0032			0.00108		0.416			0.0092	0.01		
9	25.581		0.0037			0.0014		0.4297			0.0097	0.0136		
10	25.6273		0.004			0.0015		0.437			0.01	0.014		
11	25.732		0.006			0.0016		0.4411				0.0191		
12	26.03		0.008			0.0018		0.4419						
13			0.0085											
14														
15														
Mean	25.5	0.003	0.004			0.0011		0.41	0.002	0.01	0.006	0.009	0.01	0.003
STDV.	0.2	0.003	0.002			0.0004		0.02	0.001	0.01	0.003	0.005	0.007	0.003
Certified	25.5	0.003	0.004	(<0.03)	(<0.01)	0.0011	(<0.0001)	0.41	(0.002)	(<0.03)	0.006	0.009	0.010	(0.003)
U _{CRM}	0.1	0.004	0.001			0.0002		0.01			0.002	0.004	0.008	
Methods	X,O,I,G	F	X,O,I,IM,G	O,IM	X	O,C	IM	X,O,IM,I,G	X,O,IM	X,O,IM	X,O,IM,I,G	X,O,IM,G	X,O,IM	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

Certification Laboratories

Oxford Instruments Analytical GmbH	Uedem, Germany	ATI Specialty Materials, Lockport	Lockport, NY
Huntington Alloys Corporation	Huntington, WV	Laboratory Testing, Inc.	Hatfield, PA
Carpenter Technology Corporation	Reading, PA	ATI Specialty Materials, Monroe	Monroe, NC
Laboratorio Prove Materiali S. Marco srl	Schio, Italy	Anderson Laboratories, Inc.	Greendale, WI
LECO Corporation	St. Joseph, MI	VHG Labs	Manchester, NH
EAG Laboratories	Liverpool, NY		

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 864 NIST 867 NIST 1247 NIST 865 IARM 52B IARM 202A IARM 203A IARM 56D IARM 57C IARM 68C IARM 100B IARM 241A

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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