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GIT

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CERTIFICATE OF ANALYSIS

IMZ 205

CERTIFIED REFERENCE MATERIAL
NICKEL ALLOY

Analysis listed as percent by weight [% m/m]

	Certified value	Expanded Uncertainty		Certified value	Expanded Uncertainty
Al	4.97	± 0.06	Mo	0.015	± 0.006
C	0.040	± 0.003	Nb	0.013	± 0.004
Co	5.35	± 0.06	Si	0.009	± 0.003
Cr	10.07	± 0.05	Ta	11.92	± 0.13
Fe	0.013	± 0.004	Ti	1.34	± 0.02
Hf	0.007	± 0.002	W	4.13	± 0.03
Mn	0.0020	± 0.0007	Zr	0.003	± 0.001

the expanded uncertainty bases on statistical evaluation of the contributions of the material homogeneity and the interlaboratory certification analysis

Informative values:

B	(0.0006)	P	(0.0006)
Cu	(0.0007)	S	(0.0003)
Ni	(62.44)		

Certificate Number: IMZ205-23072024
Certificate revision history on page 3

Analysis	Al	*	B**	*	C	*	Co	*	Cr	*	Cu**	*	Fe	*	Hf	*
1	4.77	5	0.000	7	0.035	5	5.270	5	9.901	7	0.000	6	0.005	1	0.0032	7
2	4.89	7	0.0001	11	0.0371	2	5.28	7	9.91	5	0.0000	7	0.0082	7	0.0055	6
3	4.93	1	0.0004	5	0.0377	2	5.326	7	9.97	1	0.0001	11	0.01	7	0.0058	5
4	4.940	7	0.0005	5	0.0386	2	5.35	7	10.0337	10	0.0004	7	0.011	11	0.0061	7
5	4.959	7	0.00085	7	0.0412	2	5.35	1	10.06	1	0.0006	7	0.0127	7	0.0077	7
6	4.96	7	0.0010	7	0.0421	5	5.35	5	10.07	1	0.001	6	0.0128	7	0.0078	5
7	4.97	5	0.00155	7	0.0422	2	5.36	1	10.08	7	0.002	7	0.0130	1	0.008	11
8	5.01	1			0.0424	5	5.380	7	10.08	7	0.00346	7	0.0184	7	0.016	7
9	5.0167	7			0.0452	2	5.38	5	10.08	7			0.020	5		
10	5.02	7					5.3866	7	10.08	5			0.0200	5		
11	5.11	1					5.41	1	10.13	7						
12																
Average[1]	4.9660		0.00061		0.0402		5.3510		10.0670		0.00067		0.0131		0.0068	
SD[2]	0.0610		0.00050		0.0032		0.0400		0.0170		0.00067		0.0050		0.0016	
u characterization[3]	0.02305		0.00024		0.00134		0.01511		0.00642		0.00031		0.00198		0.00071	
u homogeneity[4]	0.022				0.00057		0.028		0.023		0.00001		0.0010		0.00032	
Certified value[5]	**4.97**				**0.040**		**5.35**		**10.07**				**0.013**		**0.007**	
Expanded uncertainty[6]	**0.06**				**0.003**		**0.06**		**0.05**				**0.004**		**0.002**	

Analysis	Mn	*	Mo	*	Nb	*	Ni**	*	P**	*	S**	*	Si	*	Ta	*
1	0.0002	11	0.002	7	0.0046	7	62.04	1	0.000	7	0.0000	2	0.0005	1	11.58	7
2	0.0007	6	0.0046	7	0.0050	1	62.46	7	0.0001	6	0.0000	2	0.0059	7	11.749	7
3	0.0020	7	0.010	1	0.0055	6	62.50	1	0.00018	7	0.0001	2	0.006	11	11.84	7
4	0.002	7	0.0103	6	0.008	11			0.0002	11	0.0001	2	0.0088	7	11.88	7
5	0.0023	7	0.014	11	0.011	1			0.0006	7	0.00031	2	0.01	7	11.90	1
6	0.0024	7	0.0141	7	0.0115	7			0.0011	7	0.00049	7	0.01	1	11.90	5
7	0.0049	7	0.016	1	0.0116	7			0.003	7	0.0005	5	0.0110	7	11.9968	7
8			0.0196	7	0.0141	7			0.0034	5	0.0007	2	0.0128	7	12.04	1
9			0.0227	7	0.023	7									12.08	5
10			0.028	5											12.16	1
11			0.0300	5												
12																
Average[1]	0.0020		0.0151		0.0131		62.44		0.00057		0.00027		0.0085		11.9200	
SD[2]	0.0007		0.0082		0.0078		0.07		0.00052		0.00026		0.0030		0.1500	
u characterization[3]	0.00033		0.00310		0.00184				0.00022		0.00013		0.00133		0.05944	
u homogeneity[4]	5E-05		0.00017		0.0003		0.067		0.00004		0.00005		0.00062		0.021	
Certified value[5]	**0.0020**		**0.015**		**0.013**								**0.009**		**11.92**	
Expanded uncertainty[6]	**0.0007**		**0.006**		**0.004**								**0.003**		**0.13**	

Analysis	Ti	*	W	*	Zr	*
1	1.257	7	4.08	1	0.0013	6
2	1.31	5	4.09	5	0.0015	7
3	1.3186	7	4.090	7	0.0017	6
4	1.319	7	4.103	7	0.0017	7
5	1.342	7	4.138	7	0.002	11
6	1.343	7	4.15	5	0.0025	7
7	1.3450	7	4.154	7	0.004	1
8	1.35	1	4.16	1	0.0042	7
9	1.36	1	4.16	1	0.0050	7
10	1.37	1	4.19	7	0.0058	5
11	1.37	5			0.0060	5
12						
Average[1]	1.3390		4.1310		0.0032	
SD[2]	0.0240		0.0375		0.0017	
u characterization[3]	0.00907		0.01486		0.00067	
u homogeneity[4]	0.0024		0.0063		0.0001	
Certified value[5]	**1.34**		**4.13**		**0.003**	
Expanded uncertainty[6]	**0.02**		**0.03**		**0.001**	

*- analytical method used
** informative value

All values are based on recommendations of the ISO GUIDE 35:2017(E) standard:

1. Average is calculated according to Algorithm A (Guide clause A.2.3.4: Robust statistics);
2. Standard deviation is calculated according to Algorithm A (Guide clause A.2.3.4: Robust statistics);
3. Uncertainty of material characterization is based on the data obtained from the analysis performed by network of competent labs (Guide clause 9.5) and calculated according to Guide clause B.5.2.
4. Uncertainty associated with homogeneity of material is calculated In agreement with Guide clause 7.11 (Uncertainty evaluation from homogeneity studies)
5. Cerified value is the average value rounded to one or two significant digits of expanded uncertainty
6. Expanded uncertainty is an geometric average of u characterization and u homogeneity multiplied by coverage factor k = 2.

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Certification Process: Both preparation of this Reference Material and certification process were prepared according to requirements PN-EN 17034 and ISO GUIDE 35:2017(E).

Chemical Analysis: Chemical analyses were carried out on chips prepared by milling and also for bulk samples. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:
1 – wavelength dispersive x-ray fluorescence spectrometry,
2 – high frequency infra red absorption,
5 – spark atomic emission spectrometry,
6 – inductive coupled plasma mass spectrometry,
7 – inductive coupled plasma atomic emission spectrometry,
10 – titrimetry,
11 – glow discharge mass spectrometry.

The laboratories participating in certification analysis:
- Consolidated Precision Products, Rzeszów, Poland, accreditation Nadcap no. 15554182566;
- Dirats Laboratories, Westfield, MA USA, accreditation ANAB, ISO/IEC 17025, no. AT-1546
- Genitest Inc Montreal, Canada, accreditation P RI 123077;
- Inco Test Ltd Hereford, England, accreditation UKAS 0281;
- Institute for Ferrous Metallurgy – Gliwice, Poland; accreditation PCA 17025 - AB554;
- Laboratory Testing Inc., Hatfield, PA. USA, accreditation A2LA, ISO/IEC 17025, no. 0117.05,
- Lithea, Ltd. Czech Republic.

Homogeneity: The homogeneity of this Reference Material was evaluated in accordance with guidelines of ISO GUIDE 35:2017(E). Optical emission spectrometry with spark excitation method was used.

Traceability:, This Reference Material was found traceable to the following CRMs: BS 200A, BS 625 E, IMZ 180, IMZ 185, IMZ 187 and IMZ 202, IPT 37C, ICPMS-71A, ICPMS-71B, ICPMS-p71D

Material origin: This material was manufactured by Canon Muskegon, USA

Available form: 1/4 section of 88 mm cylinder and 20 mm high.

Intended use: This Reference Material is intended for use in optical emission and X-ray spectrometric methods.

Validity of certification: The certification of IMŻ 205 is valid indefinitely within the uncertainty specified provided this Reference Material is stored in dry place and in environment free from chemical or other aggressive vapours. Periodic recertification is not required. The certification is nullified if this Reference Material is damaged, contaminated or otherwise modified.

Storage: This Reference Material should be stored in dry place and in environment free from chemical or other aggressive vapours.

Safety: This Reference Material and packing do not contain substances which can directly influence health.

Inquiries regarding this Reference Material should be directed to:
rm@git.lukasiewicz.gov.pl

Approved by
Director of the Institute

Prof. Dr. Hab. Eng. Adam Zieliński

Certificate issue date: 23 July 2024

Certificate revision history:
23 July 2024 (editorial changes)
19 May 2020 (change of information regarding validity of certification, informative value for phosphorous corrected, editorial changes);
6 May 2019 (Original certificate date)