

CERTIFICATE OF REFERENCE MATERIAL

CERTIFICATE OF REFERENCE MATERIAL

FA4
Iron alloy

The assigned certified values¹ and uncertainties²

	Pb	Cr	As
	%	%	%
FA4	0.161	0.1389	0.1177
	±0.010	±0.0084	±0.0065

¹ Unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory and/or with a different method of determination.

² The certified uncertainty is the expanded uncertainty with a coverage factor $k=2$, corresponding to a level of confidence of about 95 %.

Not certified values

	Cd
	mg/kg
FA4	0.7 – 17.7

The information value for Cd is presented as a range because of different results obtained by ICP-OES and ICP-MS methods, and too small number of results obtained in characterization process

The certified reference material was developed within the REFROHS project funded by targeted subsidy of Łukasiewicz Research Network and realized by consortium of:

Łukasiewicz Research Network – Institute of Non-Ferrous Metals,

Łukasiewicz Research Network – Institute of Ferrous Metallurgy

Łukasiewicz Research Network – Cracow Institute of Technology

Certified on November 2022

SIEĆ BADAWCZA ŁUKASIEWICZ-
INSTYTUT METALI NIEŻELAZNYCH
Dyrektor Centrum Metalurgii

dr inż. *Tadeusz Gorewoda*, MBA

Signature

SIEĆ BADAWCZA ŁUKASIEWICZ
INSTYTUT METALI NIEŻELAZNYCH
DYREKTOR

dr inż. *Barbara Juszczyk*

Description of the material:

The certified reference material is available in the form of cubes (20x35x35 mm).

Traceability:

The certified values are traceable to the SI via calibration using pure metals, certified monoelement standard solutions or certified reference materials i.e. Steel 325, IMŻ-123, IMŻ-120, IMŻ -10, Steel 452, BS 1016, BS 1026, BS 1045, BS 1762, BS 2931A, BS 8620E, BS 61G, NBS 32e, BCS 214/1, BCS 212/1, BCS 218/1, euronorm 481-1, NBS 329, VHG-QC-CHECK-26-100. All values were confirmed in an inter-laboratory comparison using independent analytical methods.

Analytical methods applied for characterization:

Inductively coupled plasma optical emission spectrometry (ICP-OES)

Flame atomic absorption spectrometry (FAAS)

Inductively coupled plasma mass spectrometry (ICP-MS)

X-ray Fluorescence spectrometry with energy dispersion (EDXRF)

Participating laboratories:

	Pb	Cd	Cr	As
ICP-OES	1, 2, 3, 7	2, 3	1, 2, 3, 7	1, 2, 3, 7
FAAS	2, 4		2, 4	2
ICP-MS	2, 5	2	5	5
EXDRF	6			6

1. Łukasiewicz Research Network – Institute of Non-Ferrous Metals, Centre of Analytical Chemistry, Laboratory of Emission Spectrometry and Chromatography, Gliwice, Poland
2. Łukasiewicz Research Network – Institute of Non-Ferrous Metals, Centre of Analytical Chemistry, Laboratory of Atomic Spectrometry, Gliwice, Poland
3. Łukasiewicz Research Network – Institute of Ferrous Metallurgy, Laboratory of Analytical Chemistry, Gliwice, Poland
4. Łukasiewicz Research Network – Cracow Institute of Technology, Department of Laboratories, Cracow, Poland
5. J.S. Hamilton Poland Sp. z o.o., Gdynia, Poland
6. Research and Development Center RCC Sp. z o. o., Głuchołazy, Poland
7. Intertek Test Hizmetleri A.S., Istanbul, Republic of Türkiye

Intended use:

The CRM is intended for establishing or checking the calibration of optical emission or X-ray spectrometers for analysis of samples of similar matrix composition (for micro-analysis is not verified).

Minimum sample size:

Materials designed for spark-OES spectrometry, XRF spectrometry: >1 mm spot size. For other analytical techniques minimum 0.5 g of the CRM is required.

Instructions for storage and use:

Storage the material in a dry and clean environment at room temperature.

Transport at normal conditions.

Before every use, the surface of the CRM must be prepared by polishing. Chips for wet chemical analysis must be taken by turning of the sample surface. Overheating of the material during preparation should be avoided. Samples should be prepared in the same way as the CRM. Such preparation does not result in change of certified values.

Brief description of the production and certification process:

The CRM FA4 was made by melting of all components in a crucible induction furnace and by casting into special moulds protecting elimination of segregation of the components during solidification. Cast was done by the Łukasiewicz Research Network – Institute of Ferrous Metallurgy. Homogeneity testing carried out taking into account about 30% of the produced material. Investigations were carried out using optical emission spectrometry with low voltage spark and XRF techniques. Homogeneity was estimated statistically with application of the ANOVA.

The certification of FA4 is valid 30 years, within the measurement uncertainties specified, provided the CRM is handled in accordance with the instructions given in this certificate.

Expired date:

30 years

Certificate Revision History: 30 th of November 2022 (original certificate date)

Since 2018 our production of the certified reference materials is carried out in accordance with requirements of the ISO 17034 standard.

The Łukasiewicz Research Network —Institute of Non-Ferrous Metals holds an accreditation of the Polish Centre for Accreditation as a reference material producer according to ISO/IEC 17034 with certificate number RM 006.

Contact:

Łukasiewicz Research Network —Institute of Non-Ferrous Metals

Centre of Analytical Chemistry

Sowińskiego 5

44-100 Gliwice, Poland

e-mail: crm@imn.lukasiewicz.gov.pl

phone: +48 32 23 80 408

www.reference-materials.com

