JOINT RESEARCH CENTRE
Directorate F – Health, Consumers and Reference Materials

CERTIFICATE OF ANALYSIS

IRMM-012

Cr in 1M HCl		
	Certified value [1] [mol/mol]	Certified uncertainty [2] [mol/mol]
$n(^{50}Cr)/n(^{52}Cr)$	0.051 86	0.000 10
$n(^{53}Cr)/n(^{52}Cr)$	0.113 39	0.000 15
$n(^{54}Cr)/n(^{52}Cr)$	0.028 220	0.000 060

1) The certified values are based on the certificate of NIST SRM 979, high purity chromium nitrate. The value is traceable to the International System of Units (SI).

2) The uncertainty is the expanded uncertainty of the certified value with a coverage factor k = 2 corresponding to a level of confidence of about 95 % estimated in accordance with ISO/IEC Guide 98-3, Guide to the Expression of Uncertainty in Measurement (GUM:1995), ISO, 2008.

This certificate is valid for three years after purchase.

Sales date:

The material is a true solution and is therefore regarded homogeneous.

Geel, February 2000
Latest revision: August 2018

Signed:

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Indicative Values

	Value	Uncertainty [3]	Unit
Isotope amount fractions [1]			
$n(^{50}Cr)/n(Cr)$	0.043 453	0.000 080	mol/mol
$n(^{52}Cr)/n(Cr)$	0.837 89	0.000 13	mol/mol
$n(^{53}Cr)/n(Cr)$	0.095 01	0.000 21	mol/mol
$n(^{54}Cr)/n(Cr)$	0.023 645	0.000 050	mol/mol
Isotope mass fractions [2]			
$m(^{50}Cr)/m(Cr)$	0.041 740	0.000 078	g/g
$m(^{52}Cr)/m(Cr)$	0.837 00	0.000 13	g/g
$m(^{53}Cr)/m(Cr)$	0.096 74	0.000 12	g/g
$m(^{54}Cr)/m(Cr)$	0.024 529	0.000 052	g/g

1) Calculated from certified amount ratios.

2) Calculated from the certified amount ratios and the atomic masses given in "Additional Material Information".

3) The uncertainty is the expanded uncertainty with a coverage factor $k = 2$ corresponding to a level of confidence of about 95 % estimated in accordance with ISO/IEC Guide 98-3, Guide to the Expression of Uncertainty in Measurement (GUM:1995), ISO, 2008.

Additional Material Information

	Molar mass [g/mol]	Uncertainty [g/mol]
Cr	51.996 12	0.000 24
^{50}Cr	49.946 049 5	0.000 002 8
^{52}Cr	51.940 511 5	0.000 003 0
^{53}Cr	52.940 653 4	0.000 003 0
^{54}Cr	53.938 884 6	0.000 003 0

The molar mass for Cr was calculated from the certified isotopic amount composition and the molar masses of the isotopes. Molar masses of the isotopes were taken from: `G Audi and A H Wapstra, The 1993 atomic mass evaluation, Nucl Phys A565 (1993) 1-65.

Uncertainties given are two times the standard deviation error listed in Nucl Phys A565 (1993) 1-65.

DESCRIPTION OF THE SAMPLE

The Isotopic Reference Material IRMM-012 is based on the NIST-SRM 979 high purity chromium nitrate $[Cr(NO_3)_3 \cdot 9H_2O]$. IRMM-012 comes in a flame-sealed quartz ampoule with a Cr amount content of approximately $2 \cdot 10^{-7}$ mol·g^{-1}. The ampoule contains about 5 mL and the molarity is about 1 M HCl.

ANALYTICAL METHODS USED FOR CERTIFICATION

See W R Shields, T J Murphy, E J Catanazaro, E L Garner and, J. Research NBS 70A, No. 2, 193-197 (1966).

PARTICIPANTS

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SAFETY INFORMATION

Not classified as dangerous according to the criteria of Regulation (EC) No 1272/2008. The usual laboratory safety measures apply.

INSTRUCTIONS FOR USE AND INTENDED USE

This material is intended to be used as isotopic spike for isotope-dilution mass spectrometry.
Dispose in accordance with good laboratory practice.

STORAGE

The material should be stored at 18 °C ± 5 °C in the dark.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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