European Commission

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

CERTIFICATE OF ANALYSIS

IRMM-007/1

^{64}Zn in 0.5 M HNO_3			
	Certified value [1]	Certified uncertainty [2]	Unit
Molality ^{64}Zn	$148.261 \cdot 10^{-9}$	$0.049 \cdot 10^{-9}$	mol/g
$n(^{68}Zn)/n(^{67}Zn)$	1.070 00	0.000 47	mol/mol
$n(^{66}Zn)/n(^{64}Zn)$	0.004 679 7	0.000 005 8	mol/mol
$n(^{67}Zn)/n(^{64}Zn)$	0.021 337 4	0.000 009 8	mol/mol
$n(^{68}Zn)/n(^{64}Zn)$	0.022 830 9	0.000 008 9	mol/mol
$n(^{70}Zn)/n(^{64}Zn)$	0.000 067 57	0.000 000 32	mol/mol

1) The certified value for the molality was obtained by gravimetric weighing of the certified reference materials IRMM-652, IRMM-653 and IRMM-654. The isotope amount ratios were obtained by isotopic ratio measurements using a multiple collector ICP-MS. The values are 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, July 2007
Latest revision: August 2018

Signed:

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Indicative Values

	Value	Uncertainty [4]	Unit
Isotope amount fractions [1]			
$n(^{64}Zn)/n(Zn)$	0.953 366	0.000 016	mol/mol
$n(^{66}Zn)/n(Zn)$	0.004 461 4	0.000 005 5	mol/mol
$n(^{67}Zn)/n(Zn)$	0.0203 423	0.000 009 0	mol/mol
$n(^{68}Zn)/n(Zn)$	0.0217 662	0.000 008 2	mol/mol
$n(^{70}Zn)/n(Zn)$	0.000 064 42	0.000 000 31	mol/mol
Isotope mass fractions [2]			
$m(^{64}Zn)/m(Zn)$	0.951 026	0.000 016	g/g
$m(^{66}Zn)/m(Zn)$	0.004 589 5	0.000 005 7	g/g
$m(^{67}Zn)/m(Zn)$	0.021 244 0	0.000 009 4	g/g
$m(^{68}Zn)/m(Zn)$	0.023 069 9	0.000 008 7	g/g
$m(^{70}Zn)/m(Zn)$	0.000 070 29	0.000 000 34	g/g
Amount contents [3]			
Zn	$155.513 \cdot 10^{-9}$	$0.050 \cdot 10^{-9}$	mol/g
Zn	$9.966\,3 \cdot 10^{-6}$	$0.003\,2 \cdot 10^{-6}$	g/g
^{64}Zn	$9.478\,2 \cdot 10^{-6}$	$0.003\,1 \cdot 10^{-6}$	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) Amount content in the solution calculated from the certified values and the data from gravimetric weighing.

4) 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]
Zn	64.086 395	0.000 052
^{64}Zn	63.929 142 2	0.000 001 4
^{66}Zn	65.926 033 4	0.000 002 0
^{67}Zn	66.927 127 3	0.000 002 0
^{68}Zn	67.924 844 2	0.000 002 0
^{70}Zn	69.925 319 3	0.000 004 2

The molar mass and uncertainty of total Zn was calculated from the masses of the individual isotopes and the certified isotopic amount composition. Molar masses of the individual isotopes were taken from: The 2003 atomic mass evaluation: (II). Tables, graphs and references. Audi et al., Nuclear Physics A, 2003. 729(1): p. 337-676.

Uncertainties given are two times the standard deviation error listed in Audi et al., Nuclear Physics A, 2003. 729(1): p. 337-676

DESCRIPTION OF THE SAMPLE

The Isotopic Reference Material IRMM-007/1 has been prepared from diluting a mixture of IRMM-652, IRMM-653 and IRMM-654. IRMM-007/1 comes in a flame-sealed quartz ampoule containing about 0.78 µmol Zinc in 5 mL of a chemically stable nitric acid solution. The molarity is about 0.5 M. Details of the preparation and certification procedure can be found in Ponzevera et al.(2006), Journal of the American Society for Mass Spectrometry 17: 1412-1427.

ANALYTICAL METHODS USED FOR CERTIFICATION

Gravimetric weighing

Multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS)

PARTICIPANTS

European Commission, Joint Research Centre (JRC), Institute for Reference Materials and Measurements (IRMM), Geel, Belgium

SAFETY INFORMATION

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

H319, Eye irritation category 2: Causes serious eye irritation.

H315, Skin irritation category 2: Causes skin irritation.

P-statements

P280: Wear protective gloves and eye protection/face protection.
P264: Wash hands thoroughly after handling.
P332 + P313: If skin irritation occurs: Get medical advice/attention.
P302 + P352: IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313: If eye irritation persists: Get medical advice/attention.

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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