

# CERTIFICATE OF ANALYSIS

## ERM<sup>®</sup>-AE104a

<b>Boric acid (enriched in <sup>10</sup>B) in water</b>			
Certified quantity	Unit	Certified value <sup>1)</sup>	Uncertainty <sup>2)</sup>
Isotope abundance ratio $R(^{10}\text{B}/^{11}\text{B})$	-	0.4596	0.0006
Isotope abundance ratio $R(^{11}\text{B}/^{10}\text{B})$	-	2.1758	0.0028
Isotope abundance <sup>10</sup> B	-	0.31488	0.00028
Isotope abundance <sup>11</sup> B	-	0.68512	0.00028
Molar mass of B in solution $M(\text{B})$	$\text{g}\cdot\text{mol}^{-1}$	10.69557	0.00028

1) This certified reference material (CRM) is traceable to the International System of units (SI) in the shortest possible way, by calibrating all instruments (balance, mass spectrometer) against SI-traceable calibrators. Measurements calibrated against this CRM will, therefore, also be traceable to the SI.

2) Expanded uncertainty  $U$  with a coverage factor of  $k=2$ , as defined in the Guide to the Expression of Uncertainty in Measurement (GUM), including the repeatability of the measurement and of the determination of correction factors for systematic errors as well as contributions from certified values. The certified uncertainty value is traceable to the SI.

This certificate is valid for 10 years for units with unbroken seal stored under required conditions. This validity may be extended as further evidence of stability becomes available.

### NOTE

European Reference Material ERM<sup>®</sup>-AE104a was produced and certified under the responsibility of BAM Bundesanstalt für Materialforschung und -prüfung according to the principles laid down in the technical guidelines of the European Reference Materials<sup>®</sup> co-operation agreement between BAM-LGC-IRMM. Information on these guidelines is available on the Internet (<http://www.erm-crm.org>).

Accepted as an ERM<sup>®</sup>, Berlin, October 2010

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## Indicative Values

Quantity	Unit	Indicative value <sup>1)</sup>	Uncertainty <sup>2)</sup>
Mass fraction of B in solution, $w(B)$	$\text{mg}\cdot\text{kg}^{-1}$	1000	20

1) The boron mass fraction was determined by isotope dilution mass spectrometry and gravimetry and is considered as indicative value. It is traceable to the SI in the shortest possible way. Every measurement and correction is being calibrated using SI traceable calibrators.

2) Expanded uncertainty  $U$  with a coverage factor of  $k=2$ , as defined in the Guide to the Expression of Uncertainty in Measurement (GUM), including the repeatability of the measurement and of the determination of correction factors for systematic errors as well as contributions from certified values. The uncertainty value is traceable to the SI.

### DESCRIPTION OF THE SAMPLE

ERM-AE104a is composed of an aqueous boric acid solution and is filled in PFA-bottles of approximately 20 mL, sealed in a plastic bag. It is designed to determine mass discrimination in Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

The atomic weights used in the calculation, are the following ones:

<sup>10</sup>B: 10.0129371 (3)

<sup>11</sup>B: 11.0093055 (4)

The certified values with their combined standard uncertainties ( $k=1$ ) are given in the following table:

Certified quantity	Unit	Certified value	Standard uncertainty
Isotope abundance ratio $R(^{10}\text{B}/^{11}\text{B})$	-	0.45960	0.00030
Isotope abundance ratio $R(^{11}\text{B}/^{10}\text{B})$	-	2.1758	0.0014
Isotope abundance <sup>10</sup> B	-	0.31488	0.00014
Isotope abundance <sup>11</sup> B	-	0.68512	0.00014
Molar mass of B in solution $M(B)$	$\text{g}\cdot\text{mol}^{-1}$	10.69557	0.00014

### ANALYTICAL METHOD USED FOR CERTIFICATION

The certified values are determined by Thermal Ionization Mass Spectrometry (TIMS) using the  $\text{Na}_2\text{BO}_2^+$  technique. The measurements were calibrated by using the primary boron isotope reference material IRMM-011. More details can be taken from the certification report, which can be requested from BAM.

### PARTICIPANTS

BAM Division I.1, Working Group Metallomics

### SAFETY INFORMATION

The usual laboratory safety precautions apply.

### INSTRUCTIONS FOR USE

The solution should be withdrawn by pouring in another bottle or container and never by pipettes and the like. Any contamination will result in a bias of the isotope abundance ratio, as it is a CRM with a non-natural isotopic composition.

## STORAGE

This CRM should be stored under cool ( $5\pm 3$ ) °C and dark conditions to reduce evaporation effects.

However, BAM 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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- (b) assume any liability with respect to, or for damages resulting from, the use of any information, material, apparatus, method or process disclosed in this document save for loss or damage arising solely and directly from the negligence of BAM.

## NOTE

A detailed technical report describing the production, characterisation as well as the analytical procedures applied and the treatment of the analytical data used to certify ERM<sup>®</sup>-AE104a is available on request from BAM.

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Supply of Reference Materials by BAM Bundesanstalt für Materialforschung und -prüfung:  
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