

CERTIFICATE OF ANALYSIS

ERM[®]-AE123

Boric acid in water			
Certified quantity	Unit	Certified value ¹⁾	Uncertainty ²⁾
Isotope amount ratio $n(^{10}\text{B})/n(^{11}\text{B})$	-	0.2474	0.0004
Isotope amount ratio $n(^{11}\text{B})/n(^{10}\text{B})$	-	4.042	0.006
Isotope amount fraction $n(^{10}\text{B})/n(\text{B})$	-	0.19832	0.00022
Isotope amount fraction $n(^{11}\text{B})/n(\text{B})$	-	0.80168	0.00022
Molar mass of B in solution $M(\text{B})$	$\text{g}\cdot\text{mol}^{-1}$	10.81170	0.00022

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) The uncertainty of the certified value is the expanded uncertainty U with a coverage factor of $k=2$ in accordance with international guidelines such as JCGM 100:2008, ISO/IEC Guide 98-3 2008 and EURACHEM/CITAC CG 4 2012; this includes the repeatability of the measurement and of the determination of correction factors for systematic deviations as well as contributions from certified values.

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[®]-AE123 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[®] 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[®], Berlin, Germany, October 2013

Amendment:

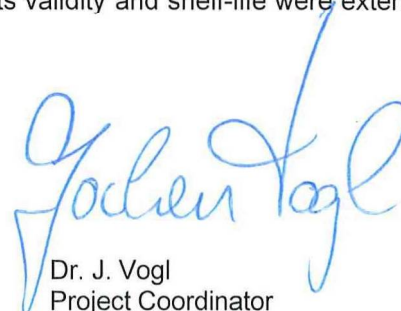
The material passed the stability test in 9/2023. Based on this result, its validity and shelf-life were extended until October 2033. For details see the amended certification report.

Berlin, November 2023

(certificate revision history on last page)



Dr. S. Richter
Committee for Certification



Dr. J. Vogl
Project Coordinator

Indicative Value			
Quantity	Unit	Indicative value ¹⁾	Uncertainty ²⁾
Mass fraction of B in solution, $w(B)$	$\text{mg}\cdot\text{kg}^{-1}$	1063	106
<p>1) The boron mass fraction was determined by 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.</p> <p>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 deviations as well as contributions from certified values.</p>			

DESCRIPTION OF THE SAMPLE

ERM-AE123 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:

¹⁰B: 10.0129371 (3)

¹¹B: 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 amount ratio $n(^{10}\text{B})/n(^{11}\text{B})$	-	0.24739	0.00017
Isotope amount ratio $n(^{11}\text{B})/n(^{10}\text{B})$	-	4.0422	0.0027
Isotope amount fraction $n(^{10}\text{B})/n(\text{B})$	-	0.19832	0.00011
Isotope amount fraction $n(^{11}\text{B})/n(\text{B})$	-	0.80168	0.00011
Molar mass of B in solution $M(\text{B})$	$\text{g}\cdot\text{mol}^{-1}$	10.81170	0.00011

ANALYTICAL METHOD USED FOR CERTIFICATION

The certified values are determined by Thermal Ionization Mass Spectrometry (TIMS) using the Na_2BO_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 1.1

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.

STORAGE

This CRM should be stored under cool (5±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

Neither BAM, its contractors nor any person acting on their behalf:

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TECHNICAL REPORT

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®-AE123 is available on request or can be downloaded from BAM website (www.bam.de).

CERTIFICATE REVISION HISTORY

October 2023 (validity and shelf life extended, uncertainty of indicative value expanded, editorial)

October 2010 (original certificate issue)

Supply of this Reference Material by:

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