

CERTIFICATE OF ANALYSIS

ERM[®]-AE122

Boric acid in water		
Certified quantity ¹⁾	Certified value ¹⁾	Uncertainty ²⁾
$\delta^{11}\text{B}_{\text{NIST 951}}$ in ‰	39.7	0.6

1) $\delta^{11}\text{B}$ is a measure for the isotope variation. It is expressed as the shift of the isotopic composition relative to an internationally accepted standard given in per mill. It is calculated according to the following equation, with NIST SRM 951 (isotope reference material for boron) being used as reference: $\delta^{11}\text{B} = ((R_{\text{sample}}/R_{\text{reference}}) - 1) \cdot 10^3$. This certified reference material (CRM) is traceable to the international δ -scale for boron with the origin being represented by NIST SRM 951.

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.

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[®]-AE122 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, October 2010

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Indicative Values

Quantity	Indicative value ¹⁾	Uncertainty ²⁾
Isotope abundance ratio $R(^{10}\text{B}/^{11}\text{B})$	0.23782	0.00031
Isotope abundance ratio $R(^{11}\text{B}/^{10}\text{B})$	4.205	0.006
Isotope abundance ^{10}B	0.19213	0.00020
Isotope abundance ^{11}B	0.80787	0.00020
Molar mass of Boron in solution $M(\text{B})$, in $\text{g}\cdot\text{mol}^{-1}$	10.81787	0.00020
Mass fraction of boron in solution, $w(\text{B})$ in $\text{mg}\cdot\text{kg}^{-1}$	100.0	2.0

1) The isotopic composition is being determined by TIMS and is given as indicative value. The boron mass fraction was determined by isotope dilution mass spectrometry and gravimetry and is considered as indicative value only. It is traceable to the International System of units (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) and includes 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-AE122 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 for calibration and validation of all procedures (e.g. TIMS, ICPMS) being used for the determination of $\delta^{11}\text{B}$ -values.

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

^{10}B : 10.0129371 (3)

^{11}B : 11.0093055 (4)

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

Certified quantity	Certified value	Standard uncertainty
$\delta^{11}\text{B}_{\text{NIST 951}}$ in ‰	39.71	0.30

ANALYTICAL METHOD USED FOR CERTIFICATION

The certified values are determined by TIMS using the Na_2BO_2^+ as well as the Cs_2BO_2^+ /graphite technique. The measurements were calibrated by using the primary boron isotope reference materials IRMM-011 and NIST SRM 951. More details can be obtained 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 $\delta^{11}\text{B}$ value.

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

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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[®]-AE122 is available on request from BAM.

Supply of Reference Materials by BAM Bundesanstalt für Materialforschung und –prüfung:
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SAFETY DATA SHEET

Based on Directive 2001/58/EC of the Commission of the European Communities

ERM-AE101, 102, 102a, 103, 104, 104a, 120, 121, 122, 123 & 124

1. Identification of the substance / preparation and of the company / undertaking

1.1 Identification of the substance or preparation:

Product name: Boric acid in water, isotopic reference material
Synonyms: H₃BO₃, aqueous solution

CAS No.: 10043-35-3 **Reference number:** ERM-AE101, 102(a), 103, 104(a), 120 to 124
EC index No.: N.A. **NFPA code:** N.D.
EINECS No.: N.A. **Molecular weight:** N.A.
RTECS No.: N.A. **Formula:** N.A.

1.2 Use of the substance or the preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

BAM Bundesanstalt für Materialforschung und -prüfung
Unter den Eichen 87
D - 12205 Berlin
Tel. : +49 30 8104 0
Fax : +49 30 811 2029

1.4 Telephone number for emergency:

+49 30 19240 (24h)
Giftnotruf Berlin, Institut für Toxikologie, Oranienburger Straße 285, D-13437 Berlin
Tel. +49-30-30686-711, FAX +49-30-30686-799, E-Mail: mail@giftnotruf.de

2. Composition / information on ingredients

Ingredients	CAS No. EINECS / ELINCS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
H ₂ O		> 99.9		
H ₃ BO ₃ , boric acid varying isotopic composition for ERM-AE101, 102, 103 and 104, for details see certificates	10043-35-3	< 0.1		

(1) For R-phrases in full: see heading 16

3. Hazards identification

- No hazard classification in accordance with directives 67/548/EEC and 1999/45/EC

4. First aid measures

4.1 Eye contact:

- Consult a doctor/medical service if irritation persists
- Rinse immediately with water

4.2 Skin contact:

- Consult a doctor/medical service if irritation persists
- Rinse with water

4.3 After inhalation:

- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

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4.4 After ingestion:

- Consult a doctor/medical service if you feel unwell
- Never give water to an unconscious person Rinse mouth with water

5. Fire fighting measures

- 5.1 Suitable extinguishing media:**
- Non combustible
- Fire extinguishing media: not applicable
- 5.2 Unsuitable extinguishing media:**
- No data available
- 5.3 Special exposure hazards:**
- No data available
- 5.4 Instructions:**
- No specific firefighting instructions required
- 5.5 Special protective equipment for firefighters:**
- Protective clothing for exposure to chemicals

6. Accidental release measures

- 6.1 Personal protection/precautions:**
See heading 8.1/8.3/10.3
- 6.2 Environmental precautions:**
- Contain leaking substance
- 6.3 Methods for cleaning up:**
- Take up liquid spill with absorbent paper
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

- 7.1 Handling:**
- Observe normal hygiene standards
- 7.2 Storage:**
- Keep container tightly closed
- Meet the legal requirements
- Storage temperature : N.D. °C
Quantity limits : N.D. kg
Storage life : N.D. days
- Materials for packaging :
- suitable : quartz
- to avoid : no data available
- 7.3 Specific uses:**
- See information supplied by the manufacturer

8. Exposure controls / Personal protection

- 8.1 Exposure limit values:**
- | | | |
|-----------------|---|------------|
| TLV-TWA | : | not listed |
| TLV-STEL | : | not listed |
| TLV-Ceiling | : | not listed |
| WEL-LTEL | : | not listed |
| WEL-STEL | : | not listed |
| MAK | : | not listed |
| MAC-TGG 8 h | : | not listed |
| MAC-TGG 15 min. | : | not listed |
| MAC-Ceiling | : | not listed |
| VME-8 h | : | not listed |
| VLE-15 min. | : | not listed |

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GWBB-8 h : not listed
GWK-15 min. : not listed
Momentary value : not listed
EC : not listed
EC-STEL : not listed

Sampling methods:
- Boric acid

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

- No data available

8.2.1.1 Respiratory protection:

- Respiratory protection not required in normal conditions

8.2.1.2 Hand protection:

- Gloves

Suitable materials: Butyl rubber
Chloroprene rubber
Neoprene
Nitrile rubber
PVC
Viton

- Breakthrough time: N.D.

8.2.1.3 Eye protection:

- No data available

8.2.1.4 Skin protection:

- Protective clothing

Suitable materials: Butyl rubber
Chloroprene rubber
Neoprene
Nitrile rubber
PVC
Viton

- Breakthrough time: N.D.

8.2.2 Environmental exposure controls: see heading 13

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C) : Liquid
Odour : N.D.
Colour : Colourless

9.2 Important health, safety and environmental information:

pH value : N.D.
Boiling point/boiling range : N.D. °C
Flashpoint : N.A. °C
Explosion limits : N.A. vol%
Vapour pressure (at 20°C) : N.D. hPa
Vapour pressure (at 50°C) : N.D. hPa
Relative density (at 20°C) : N.D.
Water solubility : N.D.
Soluble in : N.D.
Relative vapour density : N.D.
Viscosity (at 20°C) : N.D. Pa.s
Partition coefficient n-octanol/water : N.D.
Evaporation rate :
ratio to butyl acetate : N.D.
ratio to ether : N.D.

9.3 Other information:

Melting point/melting range : N.D. °C
Auto-ignition point : N.A. °C
Saturation concentration : N.D. g/m³

10. Stability and reactivity

10.1 Conditions to avoid:

- No data available

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10.2 Materials to avoid:

- No data available

10.3 Hazardous decomposition products:

- No data available

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat	:	N.D.	mg/kg
LD50 dermal rat	:	N.D.	mg/kg
LD50 dermal rabbit	:	N.D.	mg/kg
LC50 inhalation rat	:	N.D.	mg/l/4 h
LC50 inhalation rat	:	N.D.	ppm/4 h

11.2 Chronic toxicity:

EC carc. cat.	:	not listed
EC muta. cat.	:	not listed
EC repr. cat.	:	not listed
Carcinogenicity (TLV)	:	not listed
Carcinogenicity (MAC)	:	not listed
Carcinogenicity (VME)	:	not listed
Carcinogenicity (GWBB)	:	not listed
Carcinogenicity (MAK)	:	not listed
Mutagenicity (MAK)	:	not listed
Teratogenicity (MAK)	:	not listed
IARC classification	:	not listed

11.3 Routes of exposure:

- ingestion
- inhalation
- eyes
- skin

11.4 Acute effects/symptoms:

- No data available

11.5 Chronic effects:

- Contains traces of a (possible) teratogenic substance (boric acid)
- Contains traces of a (possible) fertility impairing subst.(boric acid)

12. Ecological information

12.1 Ecotoxicity:

- No data available)

12.2 Mobility:

- Volatile organic compounds (VOC): N.A.%
- No data available
- For other physicochemical properties see heading 9

12.3 Persistence and degradability:

- biodegradation BOD5:	N.A.	% ThOD
- water:	N.D.	
- soil T ½:	N.D.	days

12.4 Bioaccumulative potential:

- log Pow:	N.D.
- BCF:	N.D.

12.5 Other adverse effects:

- WGK: 3 (Classification in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 27 July 2005)
- Effect on the ozone layer: Not dangerous for the ozone layer (1999/45/EC)
- Greenhouse effect: no data available
- Effect on waste water purification: no data available

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13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (75/442/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 16 05 09 (discarded chemicals other than those mentioned in 16 05 06, 16 05 07 or 16 05 08)

13.2 Disposal methods:

- Treat using the best available techniques before discharge into drains or the aquatic environment

13.3 Packaging/Container:

- Waste material code packaging (75/442/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 07 (glass packaging)

14. Transport information

14.1 Classification of the substance in compliance with UN Recommendations

UN number : -
CLASS : -
SUB RISKS : -
PACKING : -
PROPER SHIPPING NAME : -

14.2 ADR (transport by road)

CLASS : Not subject
PACKING :
CLASSIFICATION CODE :
DANGER LABEL TANKS :
DANGER LABEL PACKAGES :

14.3 RID (transport by rail)

CLASS : Not subject
PACKING :
CLASSIFICATION CODE :
DANGER LABEL TANKS :
DANGER LABEL PACKAGES :

14.4 ADNR (transport by inland waterways)

CLASS : Not subject
PACKING :
CLASSIFICATION CODE :
DANGER LABEL TANKS :
DANGER LABEL PACKAGES :

14.5 IMDG (maritime transport)

CLASS : Not subject
SUB RISKS :
PACKING :
MFAG :
EMS :
MARINE POLLUTANT :

14.6 ICAO (air transport)

CLASS : Not subject
SUB RISKS :
PACKING :
PACKING INSTRUCTIONS PASSENGER AIRCRAFT :
PACKING INSTRUCTIONS CARGO AIRCRAFT :

14.7 Special precautions in connection with transport:

not restricted for any mode of international transport

15. Regulatory information

Classification according to directives 67/548/EEC and 1999/45/EC
NOT REQUIRED ACCORDING TO AVAILABLE INFORMATION

16. Other information

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

N.A. = NOT APPLICABLE
 N.D. = NOT DETERMINED
 (*) = INTERNAL CLASSIFICATION (NFPA)

Exposure limits:

TLV : Threshold Limit Value - ACGIH USA
 WEL : Workplace Exposure Limits - United Kingdom
 MAK : Maximale Arbeitsplatzkonzentrationen - Germany
 MAC : Maximale aanvaarde concentratie - The Netherlands
 VME : Valeurs limites de Moyenne d'Exposition - France
 VLE : Valeurs limites d'Exposition à court terme - France
 GWBB : Grenswaarde beroepsmatige blootstelling - Belgium
 GWK : Grenswaarde kortstondige blootstelling - Belgium
 EC : Indicative occupational exposure limit values - directive 2000/39/EC
 I : Inhalable fraction = T: Total dust = E: Einatembarer Aerosolanteil
 R : Respirable fraction = A: Alveolengängiger Aerosolanteil/Alveolar dust
 C : Ceiling limit

a: aerosol	r: rook/Rauch	(fume)
d: damp	st: stof/Staub	(dust)
du: dust	ve: vezel	(fibre)
fa: Faser	va: vapour	
fi: fibre	om: oil mist	
fu: fume	on: olienevel/Ölnebel	(oil mist)
p: poussière	part: particles	

Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands