# TÜBİTAK
# ULUSAL METROLOJİ ENSTİTÜSÜ

## Certificate of the Reference Material



**Name of the Material** : Boric Acid

**Material Code** : UME CRM 1207

**Issue Date** : 28.06.2021

**Revision Date** : 27.03.2025 (Revision history can be found on the last page)

**Validity Period of the Certificate** : 12 months from the sales date

**Certified Values** :

| Parameter | Mass Fraction [4] | Uncertainty [4,5] | Unit |
|---|---|---|---|
| B [1] | 17.58 | 0.62 | g/100 g |
| Fe [1] | 97.5 | 8.8 | mg/kg |
| Si [2] | 2.98 | 0.52 | mg/kg |
| $Cl^-$ [3] | 95.2 | 5.8 | mg/kg |
| $SO_4^{2-}$ [3] | 156 | 18 | mg/kg |

[1] The certified value is obtained by using ICP-OES and ID-ICP-MS methods.

[2] The certified value is obtained by using ICP-OES and ICP-MS methods.

[3] The certified value is obtained by using IC method. Methods for the determinations of total sulphur by ICP-MS and ICP-OES for $SO_4^{2-}$, and of total chlorine by ICP-OES for $Cl^-$ were used as supporting methods.

[4] The certified values and the uncertainties are traceable to the International System of Units (SI).

[5] The expanded uncertainty of the certified value includes characterization, homogeneity, stability components and is stated as the standard uncertainty of measurement multiplied by the coverage factor $k$ = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %. The standard uncertainty of measurement has been determined in accordance with GUM “Guide to the Expression of Uncertainty in Measurement”.

**Sales Date**

**Assoc. Prof. Mustafa ÇETİNTAŞ**
**Acting Director**



TÜBİTAK Gebze Yerleşkesi PK 54 41470 Gebze-Kocaeli /TÜRKİYE T +90 262 679 50 00 F +90 262 679 50 01 www.ume.tubitak.gov.tr

## Informative Values

| Parameter | Mass Fraction [1] | Uncertainty [1,2] | Unit |
|---|---|---|---|
| $B_2O_3$ | 56.6 | 2.0 | g/100 g |

[1] Calculated using the values in the atomic weight table published by IUPAC, assuming that the total amount of B certified is all in the form of $B_2O_3$.

[2] The uncertainty value includes the certified uncertainty and the uncertainty components of the atomic masses, and is the result of multiplying the calculated standard measurement uncertainty by the coverage factor $k$ = 2, which provides a confidence level of approximately 95 % for a normal distribution.

## Description

The material is approximately 120 g boric acid which is filled into the amber glass bottle after mixing the boric acid which was previously spiked with Fe and $Cl^-$, dried and milled with unspiked boric acid followed by milling, sieving and homogenisation. The detailed information about the preparation of the material can be found in the certification report.

## Intended Use

This material is intended to be used in the validation of analytical methods for the determination of B, Fe, Si, $Cl^-$ and $SO_4^{2-}$ in boric acid and for quality control of activities in this field.

## Instructions for Use

Before opening and taking a sample, the bottle should be shaken slowly and rotated in three dimension by applying small impacts to eliminate possible clumping and re-homogenize the content.

Minimum sample intake is 1 g. This material can be safely dispatched under conditions where the temperature does not exceed 45 °C for up to two weeks. The material was not subjected to any drying process before the measurements during the certification studies. The determination of moisture content of the material was carried out according to TS 2481/T2:2010 “Boric Acid” standard. Since the moisture content was found to be so small that it did not affect the certified values and the associated uncertainties, it has not been included in the calculations. The certified values are given as the dry weight basis. Although it is known that the material is hydrophobic, all precautions should be taken to prevent the material from being exposed to contamination and change in moisture content.

## Storage Conditions

The material should be stored at (18 ± 4) °C in dark environment.

TÜBİTAK UME cannot be held responsible for changes that might happen to the material at customer’s premises due to noncompliance with the instructions for use, and the storage conditions given.

**Safety Information**

The usual laboratory safety measures apply.

It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable. Please refer to the Safety Data Sheet (SDS) before any use of the material.

**Participants**

Information about the laboratory participated in the characterization study is given in the following table.

| Laboratory | Address |
|---|---|
| TÜBİTAK UME | TÜBİTAK Gebze Yerleşkesi, Barış Mahallesi, Dr. Zeki Acar Caddesi No.1, 41470 Gebze - Kocaeli / Türkiye |

**Methods and/or Techniques Used for the Determination of the Certified Values**

Information about the techniques used in the characterisation studies are given in the following table.

| Method/Technique | Parameter |
|---|---|
| Isotope Dilution Inductively Coupled Plasma Mass Spectrometry (ID-ICP-MS) | B, Fe |
| Inductively Coupled Plasma Mass Spectrometry (ICP-MS) | Si |
| Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) | B, Fe, Si |
| Ion Chromatography (IC) | $Cl^-$, $SO_4^{2-}$ |

**Revision History**

| Date | Remarks |
|---|---|
| 28.06.2021 | First issue. |
| 27.03.2025 | Certificate is revised according to the updated template for certificates.<br>Uncertainty values for silicon and sulphate are revised. |