

# Certificate of Analysis

## CERTIFIED REFERENCE MATERIAL FOR ICP-MS

ICP-MS Calibration standard - 18 components; 10mg/l each of Ag ; Al ; As ; Ba ; Be ; Cd ; Cr ; Co ; Cu ; Mn ; Ni ; Pb ; Se ; Th ; Tl ; U ; V ; Zn in HNO<sub>3</sub> 2%

Lot N: XXXXXX  
Barcode: XXXXXXXX

Ref N: MSMSBEDC.10.2N.L1.L1

Certification Date: XXXXXX

Component	Certified Value and uncertainty [mg/l]	Metrological traceability
Ag	9.994 ± 0.025 <sup>(y)</sup>	NIST SRM No 3151 Lot 992212
Al	9.953 ± 0.027 <sup>(y)</sup>	NIST SRM No 3101a Lot 140903
As	10.033 ± 0.049 <sup>(y)</sup>	NIST SRM No 3103a Lot 100818
Ba	10.067 ± 0.030 <sup>(y)</sup>	NIST SRM No 3104a Lot 140909
Be	10.037 ± 0.030 <sup>(y)</sup>	NIST SRM No 3105a Lot 090514
Cd	10.034 ± 0.031 <sup>(y)</sup>	NIST SRM No 3108 Lot 130116
Cr	9.959 ± 0.035 <sup>(y)</sup>	NIST SRM No 3112a Lot 030730
Co	9.967 ± 0.031 <sup>(y)</sup>	NIST SRM No 3113 Lot 000630
Cu	10.039 ± 0.021 <sup>(y)</sup>	NIST SRM No 3114 Lot 121207
Mn	9.987 ± 0.020 <sup>(y)</sup>	NIST SRM No 3132 Lot 050429
Ni	10.025 ± 0.023 <sup>(y)</sup>	NIST SRM No 3136 Lot 120619
Pb	9.969 ± 0.039 <sup>(y)</sup>	NIST SRM No 3128 Lot 101026
Se	10.042 ± 0.056 <sup>(y)</sup>	NIST SRM No 3149 Lot 100901
Th	9.968 ± 0.043 <sup>(y)</sup>	CPA CRM No SLTHN Lot 85026025
Tl	9.947 ± 0.053 <sup>(y)</sup>	NIST SRM No 3158 Lot 993012
U	9.955 ± 0.028 <sup>(y)</sup>	NIST SRM No 3164 Lot 080521
V	10.124 ± 0.033 <sup>(y)</sup>	NIST SRM No 3165 Lot 160906
Zn	10.005 ± 0.025 <sup>(y)</sup>	NIST SRM No 3168a Lot 120629

### Notes:

(y) WQP 5.15.1.24 The certified value was obtained by a weighted mean of the results of two independent calibration methods among: Classical Volumetric, Primary Gravimetric, Instrumental (ICP/OES, ICP/MS or IC)

Density\* 1.008 g/cm<sup>3</sup> at 20°C

Starting Material, Purity*	Batch
AgNO <sub>3</sub> 99.999%	82070502
Al 99.995%	82088125
As <sub>2</sub> O <sub>3</sub> 99.99%	82088958
Ba(NO <sub>3</sub> ) <sub>2</sub> 99.999%	82072391
Be <sub>4</sub> O(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>6</sub> 99.996%	82105228
Cd 99.999%	82088095
Cr(NO <sub>3</sub> ) <sub>3</sub> 99.999%	82085827
Co(NO <sub>3</sub> ) <sub>2</sub> 99.996%	82085698
Cu 99.999%	82070236
Mn(NO <sub>3</sub> ) <sub>2</sub> 99.993%	82099220
Ni 99.995%	82072223
Pb(NO <sub>3</sub> ) <sub>2</sub> 99.997%	82103965
Se 99.992%	82100810
Th(NO <sub>3</sub> ) <sub>4</sub> 99.95%	82082062
TiNO <sub>3</sub> 99.99%	82088972
UO <sub>2</sub> (OOCCH <sub>3</sub> ) <sub>2</sub> 99.97%	82094751



NH<sub>4</sub>VO<sub>3</sub> 99.996%      82094119  
 Zn 99.999%      82088200

\* These values are not certified

Storage Conditions: Store under normal laboratory conditions, at temperatures between 15° to 25°C

Shelf-life: XXXXXXXXXX

Date of opening: .....

(Recommended period of use should not exceed 6 months from date of opening)

**Concept of Certification and traceability statement:**

*This certified reference material is produced using a high purity starting material, acid from sub-boiling and 18 MOhm deionized water.*

*The reported expanded uncertainty of measurement 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 EA 4/02*

*Property of the result of a measurement whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties (ISO VIM)*

*The metrological traceability is assured through calibration on ICP/MS. The calibration curve is drawn using a series of standard solutions prepared from a certified reference material traceable to SI of NIST (SRM) or BAM (CRM). All contributions in relation to the certification of standard solutions are considered when evaluating the uncertainty.*

*The measurement results are traceable to SI. All analytical balances used for the preparation of the solution are calibrated yearly under an in-house procedure with analytical weights, traceable to DKD, and are checked daily.*

*Class A laboratory glassware is used.*

*The results from temperature measurement are traceable to SI. The thermometers used for solution's calibration are calibrated from an ISO 17025 accredited laboratory. The ambient conditions are controlled with a hygrometer calibrated from an ISO 17025 accredited laboratory.*

**Intended use: For Laboratory Use Only**

Calibration of ICP/MS, ICP/OES

Validation of analytical methods

Preparation of "working reference samples"

Detection limit and linearity studies

This statement is not intended to restrict the use for other purposes.

**Instructions for the correct use of this reference material:**

This certified reference material can be used directly or can be diluted in an appropriate high purity matrix. Only a clean class A glassware should be used. Do not pipet from container. Obtained concentration (in mg/l) after dilution is a result from the multiplication of certified value of CRM concentration and the CRM's volume used for dilution and divided into the flask's volume used for dilution.

**Stability and storage:**

This CRM is with a guaranteed stability until  $\pm 0.5\%$  of the certified concentration within its shelf life. Stability is guaranteed, provided that the solution is kept in its original packaging, tightly closed stored, as written in the section: Storage Conditions. The laboratory performs stability tests according to MQP 5.14.1 therefore solutions with one and the same bar-code number might have different expiration dates.

**Hazardous situation:**

The normal laboratory safety precautions should be observed when working with this CRM. Further details for the handling of this CRM are available as safety data sheet.

**Level of homogeneity:**

This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. To ensure sufficient homogeneity of the sample prior to use thoroughly mix by inversion.

**Names of certifying officers:**

Laboratory:  Tihomir Stoyanov

Manager:  Krassimira Taralova

*This document QF 5.17.1/1 version 1 is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31, ISO Guide 35, and Eurachem / CITAC Guides*

*This certificate relates solely to the lot number given above.*

*All processes (including generating of this certificate) are completely controlled by the specialized Computer-Aided-Manufacturing (CAM) software.*

*This Certified Reference Material was produced under a quality management system that is:*

- Registered to ISO 9001 Quality Management System (Lloyd's Register Quality Assurance Ltd Cert No 0039638)
- Accredited according to ISO/IEC 17025 – Testing (ANAB Cert No AT-1836)
- Accredited according to ISO 17034 - Reference Material Producer (ANAB Cert No AR-1835)