

Certificate of Analysis

CERTIFIED REFERENCE MATERIAL

Solution of 45 components : 10 mg/l each of Ca, Na, S; 5 mg/l Si; 2 mg/l Mg; 1 mg/l K; 0.5 mg/l P; 0.25 mg/l each of Al, B, Ba, Sr; 0.1 mg/l each of Cu, Fe, Zn; 0.05 mg/l each of As, Mn, Mo, V, Ni, Rb; 0.025 mg/l Pb; 0.01 mg/l each of Co, Cr, Se, Cs; 0.0025 mg/l each of Cd, Tl, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Th, Tm, U, Y, Yb; Matrix: 5% HNO₃

Lot N: 898355

Ref N: RM055736L1

Certification Date: 18.04.2023

Barcode: 97866367

Component	Certified Value and uncertainty [mg/l]	Metrological traceability
Ca	10.000 ± 0.025 ^(y)	NIST SRM No 3109a Lot 130213
K	0.999 ± 0.004 ^(y)	NIST SRM No 3141a Lot 140813
Mg	2.000 ± 0.004 ^(y)	NIST SRM No 3131a Lot 140110
Na	10.000 ± 0.030 ^(y)	NIST SRM No 3152a Lot 120715
S	10.017 ± 0.086 ^(y)	NIST SRM No SLNHS Lot 85028388
Si	4.982 ± 0.019 ^(y)	NIST SRM No 3150 Lot 130912
Al	0.2526 ± 0.0012 ^(g)	NIST SRM No 3101a Lot 140903
As	0.0496 ± 0.0003 ^(g)	NIST SRM No 3103a Lot 100818
B	0.2528 ± 0.0012 ^(g)	NIST SRM No 3107 Lot 110830
Ba	0.2517 ± 0.0013 ^(g)	NIST SRM No 3104a Lot 140909
Cd	0.00253 ± 0.00002 ^(g)	NIST SRM No 3108 Lot 130116
Co	0.01010 ± 0.00008 ^(g)	NIST SRM No 3113 Lot 190630
Cr	0.00992 ± 0.00010 ^(g)	NIST SRM No 3112a Lot 170630
Cu	0.1008 ± 0.0004 ^(g)	NIST SRM No 3114 Lot 121207
Fe	0.0995 ± 0.0005 ^(g)	NIST SRM No 3126a Lot 140812
Mn	0.0510 ± 0.0002 ^(g)	NIST SRM No 3132 Lot 050429
Mo	0.0502 ± 0.0003 ^(g)	NIST SRM No 3134 Lot 130418
Pb	0.02562 ± 0.00018 ^(g)	NIST SRM No 3128 Lot 101026
Se	0.00999 ± 0.00014 ^(g)	NIST SRM No 3149 Lot 100901
Sr	0.2548 ± 0.0025 ^(g)	CPA CRM No SRNO3 Lot 85028081
Tl	0.00253 ± 0.00003 ^(g)	NIST SRM No 3158 Lot 151215
V	0.0495 ± 0.0002 ^(g)	NIST SRM No 3165 Lot 160906
Zn	0.1008 ± 0.0005 ^(g)	NIST SRM No 3168a Lot 120629
Ce	0.00247 ± 0.00001 ^(g)	NIST SRM No 3110 Lot 090504
Cs	0.01002 ± 0.00004 ^(g)	NIST SRM No 3150 Lot 130912
Dy	0.00253 ± 0.00001 ^(g)	NIST SRM No 3115a Lot 180630
Er	0.00254 ± 0.00001 ^(g)	NIST SRM No 3116a Lot 170906
Eu	0.00250 ± 0.00001 ^(g)	NIST SRM No 3117a Lot 120705
Gd	0.00249 ± 0.00002 ^(g)	NIST SRM No 3118 Lot 992004
Ho	0.00253 ± 0.00001 ^(g)	NIST SRM No 3123 Lot 090408
La	0.00254 ± 0.00001 ^(g)	NIST SRM No 3127 Lot 151030
Lu	0.00253 ± 0.00001 ^(g)	NIST SRM No 3130 Lot 100503
Nd	0.00248 ± 0.00001 ^(g)	NIST SRM No 3135 Lot 140527
Ni	0.0498 ± 0.0003 ^(g)	NIST SRM No 3136 Lot 120619
Pr	0.00254 ± 0.00002 ^(g)	NIST SRM No 3142 Lot 990501
Sc	0.00246 ± 0.00001 ^(g)	NIST SRM No 3148 Lot 100701
Sm	0.00255 ± 0.00002 ^(g)	NIST SRM No 3147 Lot 140115
Tb	0.00255 ± 0.00001 ^(g)	NIST SRM No 3157 Lot 100518
Th	0.00250 ± 0.00002 ^(g)	CPA CRM No SLTHN Lot 85026025



CPAchem Ltd. is ISO 17034 (Cert No AR-1835)
and ISO/IEC 17025 (Cert No AT-1836) accredited by ANAB

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Tm	0.00245 ± 0.00001 ^(g)	NIST SRM No 3160 Lot 790912
U	0.00247 ± 0.00002 ^(g)	NIST SRM No 3164 Lot 080521
Y	0.00248 ± 0.00001 ^(g)	NIST SRM No 3167 Lot 120314
Yb	0.00247 ± 0.00001 ^(g)	NIST SRM No 3166 Lot 140114
P	0.505 ± 0.003 ^(g)	NIST SRM No 3139a Lot 060717
Rb	0.0507 ± 0.0002 ^(g)	NIST SRM No 3145a Lot 150622

Notes:

(g) WQP 5.15.1.6 The certified value was obtained by a gravimetric dilution of a concentrate, which had been calibrated by instrumental and/or classical analysis

(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* 1.018 g/cm³ at 20°C

Starting Material, Purity*	Batch
CaCO ₃ 99.994%	82107550
KNO ₃ 99.998%	82104047
Mg(NO ₃) ₂ 99.9986%	82107741
NaNO ₃ 99.998%	82104498
CH ₃ SO ₃ H h.p.	82119461
(NH ₄) ₂ SiF ₆ 99.999%	82105280
Al 99.995%	82088125
As 99.991%	82109790
H ₃ BO ₃ 99.999%	82079567
BaCO ₃ 99.9955%	82104214
Cd 99.999%	82088095
Co(NO ₃) ₂ 99.996%	82085698
Cr(NO ₃) ₃ 99.999%	82089665
Cu 99.999%	82070236
Fe(NO ₃) ₃ 99.997%	82107727
Mn(NO ₃) ₂ 99.993%	82099220
(NH ₄) ₆ Mo ₇ O ₂₄ 99.998%	82089740
Pb(NO ₃) ₂ 99.999%	82088286
Se 99.992%	82100810
Sr(NO ₃) ₂ 99.994%	82099473
Tl 99.99%	82044411
NH ₄ VO ₃ 99.996%	82094119
Zn 99.99%	82102036
Ce(NO ₃) ₃ 99.999%	82078447
CsNO ₃ 99.999%	82054410
Dy ₂ O ₃ 99.99%	82082451
Er ₂ O ₃ 99.99%	82024048
Eu ₂ O ₃ 99.995%	82044824
Gd ₂ O ₃ 99.999%	82071301
Ho ₂ O ₃ 99.99%	82070366
La ₂ O ₃ 99.999%	82008161
Lu ₂ O ₃ 99.995%	82072537
Nd ₂ O ₃ 99.99%	82070328
Ni 99.998%	82054953
Pr ₆ O ₁₁ 99.995%	82068424
Sc ₂ O ₃ 99.98%	82093310
Sm ₂ O ₃ 99.998%	82052904
Tb ₄ O ₇ 99.985%	82098421
Th(NO ₃) ₄ 99.99%	82012595
Tm ₂ O ₃ 99.99%	82050269
UO ₂ (OOCCH ₃) ₂ 99.97%	82094751
Y ₂ O ₃ 99.99%	82070311
Yb ₂ O ₃ 99.99%	82085544
NH ₄ H ₂ PO ₄ 99.998%	82099046
RbNO ₃ 99.99%	82072346

* These values are not certified

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

Shelf-life: 18.01.2024

Date of opening:

*(Recommended period of use should not exceed 4 month(s) from date of opening)***Concept of Certification and traceability statement:**

This certified reference material (CRM) is produced using a high purity starting material, acid from sub-boiling and 18 MOhm deionised water and filtered through a 0.2 micron filter.

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 using 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/OES, AAS

Preparation of "working reference samples"

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

Validation of analytical methods

Detection limit and linearity studies

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. If storage of a partially used bottle is necessary, the cap should be tightly sealed and the bottle should be stored in refrigerator to minimize transpiration rate. 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

- Accredited according to ISO 17034