

### CERTIFIED REFERENCE MATERIAL

This document is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31<sup>[1]</sup>, ISO Guide 35<sup>[2]</sup>, and Eurachem / CITAC Guides<sup>[3]</sup>

Lot N: 169285

Barcode: 84450074

Certification Date: 10.09.2016

Date of Stability last check:

**Description of the Reference Material (CRM):**

**Solution of:** Aluminium (Al) concentration 1.000 g/l in 2% Nitric Acid (HNO<sub>3</sub>)

**Ref N:**

LK1-00130201

**Certified value/  
Uncertainty:**

Element

Certified Value and  
Uncertainty [mg/l]:

Metrological traceability:

Al

1002.8 ± 3.3 <sup>(y)</sup>

NIST SRM No 3101a Lot 060502; NIST SRM No 3168a Lot 120629

**Method(s) of  
certification used:**

CRM's calibration procedure(s):

Notes:

(y) WQP 5.15.1.24

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

#### 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-OES. The calibration curve is drawn using a series of standard solutions prepared from a certified reference material traceable to SI of NIST (SRM) and of accredited according to ISO/IEC 17025<sup>[4]</sup> and/or ISO Guide 34<sup>[5]</sup> laboratories/producers. 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.

**Starting material, purity \* :**

Al 99.995%

**Density \*:**

1.009 g/cm<sup>3</sup> at 20 °C

**Minimum shelf-life:**

09.2019 (unopened bottle in aluminized bag)

**Date of opening:**

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(Recommended period of use should not exceed 12 months from date of opening.)

\* These values are not certified

### Intended use: **For Laboratory Use Only**

Calibration of ICP-OES, AAS

Preparation of "working reference samples"

Validation of analytical methods

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:

Storage conditions: To be stored under normal laboratory conditions

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 as written in Storage conditions. According to an in-house procedure the producer will monitor this CRM at appropriate intervals and the purchasers will be notified of any significant changes resulting in recertification or with withdrawal of the CRM during the state period of the validity of the certificate.

The original packaging consists of the bottle & its aluminized bag. The aluminized bag is an inseparable part of the unit packing of the CRM.

### Hazardous situation:

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

### Level of homogeneity:

The material was tested for homogeneity by analyzing randomly selected samples according to an in-house procedure. The level of homogeneity proved satisfactory for a sample volume of 20 ml. The uncertainty incorporates the sample standard deviation combined with the uncertainty calculated from homogeneity and stability studies.

To ensure sufficient homogeneity of the sample prior to use thoroughly mix by inversion.

### Names of certifying officers:

Laboratory:  Tihomir Stoyanov

Manager:  Krassimira Taralova

[1] ISO Guide 31: Reference materials - Contents of certificates and labels

[2] ISO Guide 35: Reference materials - General and statistical principles for certification

[3] EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement

[4] ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories

[5] ISO Guide 34: General Requirements for the Competence of Reference Material Producers

*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 SOF0368072)

- Accredited according to ISO/IEC 17025 – Testing (ANAB Cert No AT-1836)

- Accredited according to ISO Guide 34 - Reference Material Producer (ANAB Cert No AR-1835)

### Trace impurities in the actual solution reported in ppm:

(all values below are nominal and not certified)

Ag	0.01	Cu	0.004	La	<0.0024	Pt	<0.0097	Tb	<0.022
Al	*	Dy	<0.0054	Li	<0.0001	Rb	<0.063	Te	<0.031
As	0.005	Er	<0.0035	Lu	<0.0062	Re	<0.0081	Th	<0.014
Au	<0.016	Eu	<0.0039	Mg	<0.0006	Rh	<0.0038	Ti	<0.0012
B	<0.0078	Fe	<0.0025	Mn	<0.001	Ru	<0.0089	Tl	<0.028
Ba	<0.0005	Ga	<0.020	Mo	<0.0024	S	<0.071	Tm	<0.0023
Be	<0.0001	Gd	<0.0028	Na	0.007	Sb	<0.020	U	<0.45
Bi	<0.016	Ge	<0.020	Nb	<0.0066	Sc	<0.0016	V	<0.0018
Ca	0.088	Hf	<0.0032	Nd	<0.0058	Se	<0.023	W	<0.017
Cd	<0.0012	Hg	<0.024	Ni	<0.0061	Si	<0.037	Y	<0.0007
Ce	<0.0085	Ho	<0.0053	P	<0.048	Sm	<0.0058	Yb	<0.0003
Co	<0.0028	In	<0.098	Pb	<0.021	Sn	<0.050	Zn	0.01
Cr	<0.0014	Ir	<0.0061	Pd	<0.033	Sr	<0.00006	Zr	<0.0007
Cs	<0.05	K	0.038	Pr	<0.0046	Ta	<0.004		