

Certificate of Analysis

Aluminum Standard

Product Number: ICP-413

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Lot Number: 0006505693

Lot Issue Date: 09-Dec-2019

Expiration Date: 31-Dec-2024

This Certified Reference Material (CRM) is intended for use as a calibration standard for the quantitative determination of the analyte listed. The CRM was manufactured and verified in accordance with Agilent's ISO 9001 registered quality system. The certified concentration value reported for the analyte is based upon the gravimetric and volumetric measurements made during the preparation of the CRM. The analyte concentrations were verified by Agilent's ISO 17025 accredited laboratory using an appropriate analytical technique.

Certified Value: 9.98 ± 0.17 µg/mL Aluminum

Description:

Matrix: 0.5% nitric acid in water

Starting Material(s): aluminum nitrate nonahydrate (ICP grade) (as aluminum) **Lot No.:** RM14803-01 **Purity:** 99.999 %

Atomic Weight Al: 26.9815386

This RM was manufactured using purified acids and 18 megohm double deionized water, and is packaged in sealed, low density polyethylene (LDPE) bottles.

Analytical Confirmation:

The analyte concentration was verified by Agilent's ISO 17025 accredited laboratory using inductively coupled plasma spectroscopy (ICP / ICP-MS) versus NIST SRM 3101a.

Traceability:

Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

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Estimation of Uncertainties:

Uncertainties in certified values are estimated in accordance with ISO 17034 and ISO Guide 35, and include assessments of the uncertainty contributions resulting from the gravimetric characterization of the reference material (u_{char}), the packaging of the reference material into individual units (u_{bb}), the transportation of the reference material to the end user (u_{sts}), and the long term storage of the reference material (u_{lts}). The uncertainty (U) is reported as an expanded uncertainty calculated as:

$$U = k\sqrt{u_{char}^2 + u_{bb}^2 + u_{sts}^2 + u_{lts}^2}$$

using a coverage factor of $k=2$, which gives a level of confidence of approximately 95%.

Non-Certified Values:

Density: 1.001 g/mL @ 20.0 ± 0.5°C

Trace Metallic Impurities in Solution Standard in µg/mL:

<u>s</u>	Al		<u>*</u>	Ga	<0.005	D	<u>n</u>	Nb		<u>n</u>	S				
<u>*</u>	Sb	<0.005	ND	<u>n</u>	Ge		<u>n</u>	Os		<u>n</u>	Ta				
<u>*</u>	As	<0.005	ND	<u>n</u>	Au		<u>*</u>	Pd	<0.005	ND	<u>n</u>	Te			
<u>*</u>	Ba	<0.005	ND	<u>n</u>	Hf		<u>*</u>	P	<0.005	ND	<u>n</u>	Tb			
<u>*</u>	Be	<0.005	ND	<u>n</u>	Ho		<u>*</u>	Pt	<0.005	ND	<u>*</u>	Tl	<0.005	ND	
<u>*</u>	Bi	<0.005	ND	<u>*</u>	In	<0.005	ND	<u>*</u>	K	<0.005	ND	<u>n</u>	Th		
<u>*</u>	B	<0.005	ND	<u>n</u>	Ir			<u>n</u>	Pr			<u>n</u>	Tm		
<u>*</u>	Cd	<0.005	ND	<u>*</u>	Fe	<0.005	D	<u>n</u>	Re			<u>*</u>	Sn	<0.005	ND
<u>n</u>	Cs			<u>*</u>	La	<0.005	ND	<u>n</u>	Rh			<u>*</u>	Ti	<0.005	ND
<u>*</u>	Ca	<0.005	D	<u>*</u>	Pb	<0.005	ND	<u>n</u>	Rb			<u>n</u>	W		
<u>n</u>	Ce			<u>*</u>	Li	<0.005	ND	<u>n</u>	Ru			<u>n</u>	U		
<u>*</u>	Cr	<0.005	ND	<u>n</u>	Lu			<u>n</u>	Sm			<u>*</u>	V	<0.005	ND
<u>*</u>	Co	<0.005	ND	<u>*</u>	Mg	<0.005	ND	<u>n</u>	Sc			<u>n</u>	Yb		
<u>*</u>	Cu	<0.005	ND	<u>*</u>	Mn	<0.005	ND	<u>*</u>	Se	<0.005	ND	<u>n</u>	Y		
<u>n</u>	Dy			<u>*</u>	Hg	<0.005	ND	<u>*</u>	Si	<0.005	ND	<u>*</u>	Zn	<0.005	ND
<u>*</u>	Er	<0.005	ND	<u>*</u>	Mo	<0.005	ND	<u>*</u>	Ag	<0.005	ND	<u>n</u>	Zr		
<u>*</u>	Eu	<0.005	ND	<u>n</u>	Nd			<u>*</u>	Na	<0.005	D				
<u>*</u>	Gd	<0.005	ND	<u>*</u>	Ni	<0.005	ND	<u>*</u>	Sr	<0.005	ND				

* - element checked for
D - detected

n - not checked for
ND - not detected

s - standard element
i - spectral interference

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Storage:

Store at Room Temperature (15° to 30°C).

Store the RM according to directions noted above. Keep container tightly closed in a dry and well-ventilated place. Extended storage at temperatures below 4°C or above 35°C is not recommended.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the bottle and should be processed without delay for the certified values to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipeting to the bottle. Tightly cap the bottle after removing any of the material, and store according to the instructions noted above. Since this is a solution, there is no minimum subsample size required to be drawn.

Expiration of Certification:

The certification of this CRM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the CRM is handled and stored in accordance with instructions given in this certificate. This certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

The long term stability of this RM will be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, Agilent Technologies will notify the purchaser.

Product Hazards:

Safety Data Sheets are available on www.ultrasci.com or by contacting our Technical Service department.


Monica Bourgeois
QMS Representative