Certificate of Analysis

ULTRAgold® Barium Standard

Product Number ICP-356 **Page:** 1 of 3

Lot Number: AU-00033 **Lot Issue Date:** 15-Jun-2010 **Expiration Date:** 30-Apr-2016

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 ULTRA'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 ULTRA's ISO 17025 accredited laboratory using an appropriate analytical technique.

Certified Value: 1002 ± 4 µg/mL Barium

Note: Certificate revised 13 Mar 2014 to extend expiration date based upon ongoing stability testing.

Description:

Matrix: 2% nitric acid in water

Starting Material(s) barium nitrate **Lot No.:** NT04674 **Purity:** 99.9999 %

Atomic Weight Ba: 137.327

This CRM 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 ULTRA's ISO 17025 accredited laboratory using inductively coupled plasma spectroscopy (ICP / ICP-MS) versus NIST SRM 3104a.

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 Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:

Uncertainties in certified values are estimated in accordance with ISO Guides 34 and 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%.

ACCREDITED

ISO Guide 34 Accredited Reference Material Producer Cert. No. 0851-02

ISO 17025 Accredited Testing Lab Cert. No. 0851-01

ISO 9001 Registered TUV USA, Inc.

William J. Leahy
Quality Assurance Manager

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Non-Certified Values:

Density: 1.007 g/mL @ 23.0 ± 0.5°C

Trace Metallic Impurities in Solution Standard in µg/mL:

*	Al	<0.005	ND	*	Ga	<0.005	ND	n	Nb			n	S		
*	Sb	<0.005	ND	n	Ge			n	Os			n	Ta		
*	As	<0.005	ND	n	Au			*	Pd	<0.005	ND	n	Te		
s	Ba			n	Hf			*	P	<0.005	ND	n	Tb		
*	Be	<0.005	ND	n	Ho			*	Pt	<0.005	ND	*	Tl	<0.005	ND
*	Bi	<0.005	ND	*	In	<0.005	ND	*	K	<0.005	ND	n	Th		
*	B	<0.005	ND	n	Ir			n	Pr			n	Tm		
*	Cd	<0.005	ND	*	Fe	<0.005	ND	n	Re			*	Sn	<0.005	ND
n	Cs			*	La	<0.005	ND	n	Rh			*	Ti	<0.005	ND
*	Ca	<0.005	ND	*	Pb	<0.005	ND	n	Rb			n	W		
n	Ce			*	Li	<0.005	ND	n	Ru			n	U		
*	Cr	<0.005	ND	n	Lu			n	Sm			*	V	<0.005	ND
*	Co	<0.005	ND	*	Mg	<0.005	ND	n	Sc			n	Yb		
*	Cu	<0.005	ND	*	Mn	<0.005	ND	*	Se	<0.005	ND	n	Y		
n	Dy			*	Hg	<0.005	ND	*	Si	<0.005	ND	*	Zn	<0.005	ND
*	Er	<0.005	ND	*	Mo	<0.005	ND	*	Ag	<0.005	ND	n	Zr		
*	Eu	<0.005	ND	n	Nd			*	Na	<0.005	ND				
*	Gd	<0.005	ND	*	Ni	<0.005	ND	*	Sr	<0.010	D				

* - element checked for n - not checked for s - standard element

D - detected ND - not detected i - spectral interference

Storage:

Store at Room Temperature (15-30°C). Do Not Refrigerate.

Store the CRM 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.

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ISO Guide 34 Accredited Reference Material Producer Cert. No. 0851-02

ISO 17025 Accredited Testing Lab Cert. No. 0851-01

ISO 9001 Registered TUV USA, Inc.

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Quality Assurance Manager

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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 CRM will be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Product Hazards:

Material Safety Data Sheets are available on ULTRA's web site or by contacting our Technical Service department.

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