INORGANIC VENTURES™
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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principals."

2.0 **DESCRIPTION OF CRM** Stock Solution

Catalog No.: IV-ICPMS-71A

Lot Number: **B2-MEB264139**

Matrix: 3% HNO3(v/v)

10.00 µg/mL ea:

Ag,	Al,	As,	B,	Ba,	Be,	Ca,	Cd,	Ce,	Co,	Cr3,	Cs,	Cu,	Dy,	Er,	Eu,
Fe,	Ga,	Gd,	Ho,	K,	La,	Lu,	Mg,	Mn,	Na,	Nd,	Ni,	P,	Pb,	Pr,	Rb,
S,	Se,	Sm,	Sr,	Th,	Tl,	Tm,	U,	V,	Yb,	Zn					

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE	ELEMENT	CERTIFIED VALUE
Aluminum, Al	10.02 ± 0.04 µg/mL	Arsenic, As	10.05 ± 0.03 µg/mL	Barium, Ba	10.03 ± 0.04 µg/mL
Beryllium, Be	10.00 ± 0.03 µg/mL	Boron, B	10.02 ± 0.03 µg/mL	Cadmium, Cd	9.99 ± 0.03 µg/mL
Calcium, Ca	10.04 ± 0.08 µg/mL	Cerium, Ce	9.98 ± 0.03 µg/mL	Cesium, Cs	10.01 ± 0.03 µg/mL
Chromium+3, Cr3	10.04 ± 0.04 µg/mL	Cobalt, Co	10.02 ± 0.03 µg/mL	Copper, Cu	9.99 ± 0.03 µg/mL
Dysprosium, Dy	10.02 ± 0.03 µg/mL	Erbium, Er	10.00 ± 0.03 µg/mL	Europium, Eu	9.97 ± 0.04 µg/mL
Gadolinium, Gd	10.01 ± 0.03 µg/mL	Gallium, Ga	10.02 ± 0.03 µg/mL	Holmium, Ho	9.99 ± 0.07 µg/mL
Iron, Fe	9.99 ± 0.03 µg/mL	Lanthanum, La	10.01 ± 0.04 µg/mL	Lead, Pb	10.01 ± 0.04 µg/mL
Lutetium, Lu	10.01 ± 0.03 µg/mL	Magnesium, Mg	10.03 ± 0.03 µg/mL	Manganese, Mn	9.99 ± 0.03 µg/mL
Neodymium, Nd	10.00 ± 0.03 µg/mL	Nickel, Ni	10.02 ± 0.03 µg/mL	Phosphorus, P	10.01 ± 0.03 µg/mL
Potassium, K	10.04 ± 0.04 µg/mL	Praeseodymium, Pr	10.01 ± 0.03 µg/mL	Rubidium, Rb	9.98 ± 0.03 µg/mL
Samarium, Sm	10.01 ± 0.03 µg/mL	Selenium, Se	10.00 ± 0.03 µg/mL	Silver, Ag	10.01 ± 0.04 µg/mL
Sodium, Na	9.99 ± 0.05 µg/mL	Strontium, Sr	10.01 ± 0.03 µg/mL	Sulfur, S	10.04 ± 0.03 µg/mL
Thallium, Tl	10.04 ± 0.03 µg/mL	Thorium, Th	10.01 ± 0.04 µg/mL	Thulium, Tm	10.01 ± 0.03 µg/mL
Uranium, U	10.04 ± 0.04 µg/mL	Vanadium, V	10.01 ± 0.04 µg/mL	Ytterbium, Yb	10.02 ± 0.04 µg/mL
Zinc, Zn	10.03 ± 0.05 µg/mL				

Certified Density: 1.014 g/mL (measured at 22° C)

The following equations are used in the calculation of the certified value and the uncertainty

$$\text{Certified Value } (0) = \frac{\Sigma x_i}{n}$$

(0) = mean
x_i = individual results
n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$$

Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

Certified Abundance: The 235U in this standard is depleted. The Certified abundances in Atom % are as follows:

IV's Certified Abundance

Isotope	Atom%
Uranium 238U	99.8 ± 0.1
235U	0.25 ± 0.05

4.0 TRACEBILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard 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, 2nd ed., 1993, definition 6.10)

· This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 ASSAY INFORMATION

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	992212
Al	Calculated		See Sec. 4.2
As	ICP Assay	3103a	010713
B	ICP Assay	3107	991907
Ba	ICP Assay	3104a	992907
Be	Calculated		See Sec. 4.2
Ca	EDTA	928	928
Cd	ICP Assay	3108	060531
Ce	ICP Assay	3110	890602
Co	EDTA	928	928
Cr3	ICP Assay	3112a	990607
Cs	Gravimetric		See Sec. 4.2
Cu	ICP Assay	3114	891811
Dy	EDTA	928	928
Er	EDTA	928	928
Eu	EDTA	928	928
Fe	EDTA	928	928
Ga	ICP Assay	3119a	890709
Gd	EDTA	928	928
Ho	EDTA	928	928
K	ICP Assay	3141a	051220
La	ICP Assay	3127a	890402
Lu	EDTA	928	928
Mg	EDTA	928	928
Mn	EDTA	928	928
Na	ICP Assay	3152a	010728
Nd	ICP Assay	3135a	992803
Ni	EDTA	928	928
P	ICP Assay	3139a	890607
Pb	ICP Assay	3128	030721
Pr	EDTA	928	928
Rb	IC Assay	3145a	891203
S	Acidimetric	84k	84k
Se	Gravimetric		See Sec. 4.2
Sm	ICP Assay	3147a	892911
Sr	EDTA	928	928
Th	EDTA	928	928
Tl	ICP Assay	3158	993012
Tm	EDTA	928	928
U	ICP Assay	3164	891509

ELEMENT	METHOD	NIST SRM#	SRM LOT#
Ag	Volhard	999a	999a
Al	ICP Assay	3101a	010808
As	Gravimetric		See Sec. 4.2
B	Calculated		See Sec. 4.2
Ba	Gravimetric		See Sec. 4.2
Be	ICP Assay	3105a	892707
Ca	ICP Assay	3109a	000622
Cd	EDTA	928	928
Ce	EDTA	928	928
Co	ICP Assay	3113	00630
Cr3	Gravimetric		See Sec. 4.2
Cs	IC Assay	3111a	050614
Cu	EDTA	928	928
Dy	ICP Assay	3115a	990504
Er	ICP Assay	3116a	000831
Eu	ICP Assay	3117a	991307
Fe	ICP Assay	3126a	000606
Ga	EDTA	928	928
Gd	ICP Assay	3118a	992004
Ho	ICP Assay	3123a	790812
K	Gravimetric		See Sec. 4.2
La	EDTA	928	928
Lu	ICP Assay	3130a	892704
Mg	ICP Assay	3131a	991107
Mn	ICP Assay	3132	890903
Na	Gravimetric		See Sec. 4.2
Nd	EDTA	928	928
Ni	ICP Assay	3136	000612
P	Acidimetric	84k	84k
Pb	EDTA	928	928
Pr	ICP Assay	3142a	990501
Rb	Gravimetric		See Sec. 4.2
S	ICP Assay	3154	892205
Se	ICP Assay	3149	992106
Sm	EDTA	928	928
Sr	ICP Assay	3153a	990906
Th	ICP Assay	3159	992912
Tl	EDTA	928	928
Tm	ICP Assay	3160a	790912
U	Gravimetric		See Sec. 4.2

V	ICP Assay	3165	992706	V	EDTA	928	928
Yb	EDTA	928	928	Yb	ICP Assay	3166a	790512
Zn	ICP Assay	3168a	001402	Zn	EDTA	928	928

4.2 **BALANCE CALIBRATION -** All balances are checked daily using an in-house procedure. The weights used for testing are annually compared to master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification

4.4 **GLASSWARE CALIBRATION** - An in-house procedure is used to calibrate all Class A Glassware used in the manufacturing and quality control of CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES IN µg/mL - N/A

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
HPLC, IC, TLC, ISE, IR, NMR, UV/VIS, MS, Capillary Eletrophoresis, Potentiometry, Wet Chemistry and Voltammetry
For the validation of analytical methods
For the preparation of “working reference samples”
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact Technical Staff

This CRM was manufactured using 18 megohn doubly deionized water that has been filtered through a 0.2 micron filter.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep **Tightly** sealed when not in use. Store and use at 20 ± 4ºC. **Do Not** pipette from the container. **Do Not** return portions removed from pipetting to container.

Element Specific Information - For specific information regarding any element: Contact technical staff.

Low Silver Note: This solution contains “LOW” levels of Silver. Please store this entire bottle inside a sealed glass jar.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to in-house procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

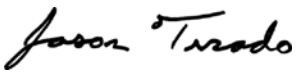
11.1 Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special environmental controls that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 05, 2008
Expiration Date:

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Jason Tirado, Product Documentation Administrator



Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, PhD., Senior Technical Director