

## 1.0 ACCREDITATION / REGISTRATION

**INORGANIC VENTURES** is accredited to ISO Guide 34, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories".

Inorganic Ventures is also an ISO 9001 registered manufacturer (SAI Global File Number 010105).



## 2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution

Catalog Number: QCP-QCS-3

Lot Number: J2-MEB589138

Matrix: 7% (v/v) HNO<sub>3</sub>

Value / Analyte(s): 50 µg/mL ea:

Se,

10 µg/mL ea:

Ag,

Ba,

Cd,

Cu,

Mg,

Na,

Sb,

U,

Al,

Be,

Co,

Fe,

Mn,

Ni,

Th,

V,

As,

Ca,

Cr<sup>3+</sup>,

K,

Mo,

Pb,

Tl,

Zn

**Second Source:** Whenever possible, this solution was manufactured from a second set of concentrates in our manufacturing facility.

## 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	10.01 ± 0.05 µg/mL	Antimony, Sb	10.00 ± 0.08 µg/mL
Arsenic, As	10.01 ± 0.07 µg/mL	Barium, Ba	10.01 ± 0.07 µg/mL
Beryllium, Be	10.01 ± 0.05 µg/mL	Cadmium, Cd	10.01 ± 0.05 µg/mL
Calcium, Ca	10.01 ± 0.06 µg/mL	Chromium+3, Cr3	10.01 ± 0.06 µg/mL
Cobalt, Co	10.01 ± 0.06 µg/mL	Copper, Cu	10.01 ± 0.06 µg/mL
Iron, Fe	10.01 ± 0.06 µg/mL	Lead, Pb	10.01 ± 0.07 µg/mL
Magnesium, Mg	10.01 ± 0.05 µg/mL	Manganese, Mn	10.01 ± 0.06 µg/mL
Molybdenum, Mo	10.01 ± 0.05 µg/mL	Nickel, Ni	10.01 ± 0.06 µg/mL
Potassium, K	10.01 ± 0.04 µg/mL	Selenium, Se	50.03 ± 0.31 µg/mL
Silver, Ag	10.00 ± 0.06 µg/mL	Sodium, Na	10.01 ± 0.04 µg/mL
Thallium, Tl	10.01 ± 0.08 µg/mL	Thorium, Th	10.01 ± 0.05 µg/mL
Uranium, U	10.01 ± 0.06 µg/mL	Vanadium, V	10.01 ± 0.05 µg/mL
Zinc, Zn	10.01 ± 0.07 µg/mL		

**Certified Density:** 1.036 g/mL (measured at 20 ± 1 °C)

**Assay Information:**

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Ag	ICP Assay	3151	992212
Ag	Volhard	999b	999b
Al	ICP Assay	3101a	060502
Al	EDTA	928	928
As	Calculated		See Sec. 4.2
As	ICP Assay	3103a	100818
Ba	Gravimetric		See Sec. 4.2
Ba	ICP Assay	3104a	070222
Be	Calculated		See Sec. 4.2
Be	ICP Assay	3105a	090514
Ca	ICP Assay	3109a	050825
Ca	EDTA	928	928
Cd	ICP Assay	3108	060531
Cd	EDTA	928	928
Co	ICP Assay	3113	000630 Co
Co	EDTA	928	928
Cr3	Calculated		See Sec. 4.2
Cr3	ICP Assay	3112a	030730
Cu	ICP Assay	3114	011017
Cu	EDTA	928	928
Fe	ICP Assay	3126a	051031
Fe	EDTA	928	928
K	Gravimetric		See Sec. 4.2
K	ICP Assay	3141a	051220
Mg	ICP Assay	3131a	050302
Mg	EDTA	928	928
Mn	ICP Assay	3132	050429
Mn	EDTA	928	928
Mo	Calculated		See Sec. 4.2
Mo	ICP Assay	3134	891307
Na	Gravimetric		See Sec. 4.2
Na	ICP Assay	3152a	120715
Ni	ICP Assay	3136	120619
Ni	EDTA	928	928
Pb	ICP Assay	3128	101026
Pb	EDTA	928	928
Sb	Calculated		See Sec. 4.2
Sb	ICP Assay	3102A	061229
Se	Calculated		See Sec. 4.2
Se	ICP Assay	3149	100901
Th	EDTA	928	928
Th	ICP Assay	Traceable to SRM 3159	992912
Ti	ICP Assay	3158	993012
U	Calculated		See Sec. 4.2
U	ICP Assay	3164	891509
V	ICP Assay	3165	992706
V	EDTA	928	928
Zn	ICP Assay	3168a	080123
Zn	EDTA	928	928

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean  
 $x_i$  = individual results  
n = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[ \sum (s_i)^2 \right]^{1/2}$$

2 = the coverage factor.  
 $\left[ \sum (s_i)^2 \right]^{1/2}$  = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

**Certified Abundance:**

IV's Certified Abundance	
<u>Isotope</u>	<u>Atom %</u>
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.29 ± 0.05

**4.0 TRACEABILITY TO NIST**

- 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/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

**4.1 Thermometer Calibration**

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

**4.2 Balance Calibration**

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

**4.3 Glassware Calibration**

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

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

N/A

**6.0 INTENDED USE**

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

**7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL**

**7.1 Storage and Handling Recommendations**

- Keep cap tightly sealed when not in use. Store and use at 20 ± 4° C. Do not pipette from the container. Do not return removed aliquots to container.

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

**Uranium Note:** If uranium is present in this standard, it is natural abundance unless specified in Section 3.0

**8.0 HAZARDOUS INFORMATION**

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

**9.0 HOMOGENEITY**

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

**10.0 QUALITY STANDARD DOCUMENTATION**

**10.1 10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

**10.2 10CFR21 - Nuclear Regulatory Commission**

- Reporting defects and Non-Compliance

**10.3 ISO 9001 Quality Management System Registration**

- SAI Global File Number 010105

**10.4 ISO/IEC Guide 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"**

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

**10.5 ISO/IEC Guide 34 "General Requirements for the Competence of Reference Material Producers"**

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

**11.0 CERTIFICATION, EXPIRATION AND PERIOD OF VALIDITY**

**11.1 Certification Issue Date**

July 23, 2015

**11.2 Expiration Date**

**11.3 Period of Validity**

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is handled and stored in accordance with instructions given in Sec 7.0 and used prior to the date given in Sec 11.2. This certification is nullified if the CRM/RM is damaged, contaminated, or otherwise modified.

**12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS**

**Certificate Prepared By:**

James King Jr  
Product Documentation Supervisor



**Certificate Approved By:**

Michael Booth  
QC Supervisor



**Certifying Officer:**

Paul Gaines  
PhD., Senior Technical Director

