

- 4.2 BALANCE CALIBRATION** - All analytical balances are calibrated yearly by an A2LA accredited calibration laboratory and are traceable to a class E 2 analytical weight set with NIST Traceability No. 822/269558-04. 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).
- 4.3 THERMOMETER CALIBRATION** - All thermometers are NIST traceable through thermometers that are calibrated by an A2LA accredited calibration laboratory.
- 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

CRM's solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>s</u> Al	<u>M</u> Dy < 0.03285	<u>Q</u> Li < 0.00020	<u>M</u> Pr < 0.00164	<u>M</u> Te < 0.16423
<u>M</u> Sb < 0.00274	<u>M</u> Er < 0.02737	<u>M</u> Lu < 0.00219	<u>M</u> Re < 0.00547	<u>M</u> Tb < 0.00164
<u>M</u> As < 0.05474	<u>M</u> Eu < 0.01642	<u>Q</u> Mg 0.00029	<u>M</u> Rh < 0.00547	<u>M</u> Tl < 0.00547
<u>M</u> Ba < 0.05474	<u>M</u> Gd < 0.00547	<u>Q</u> Mn < 0.00003	<u>M</u> Rb < 0.00547	<u>M</u> Th < 0.00547
<u>Q</u> Be < 0.00017	<u>M</u> Ga < 0.00547	<u>Q</u> Hg < 0.00700	<u>M</u> Ru < 0.01095	<u>M</u> Tm < 0.00219
<u>M</u> Bi < 0.00219	<u>M</u> Ge < 0.03285	<u>M</u> Mo < 0.01095	<u>M</u> Sm < 0.00547	<u>M</u> Sn < 0.02737
<u>Q</u> B < 0.01000	<u>M</u> Au < 0.01642	<u>M</u> Nd < 0.01095	<u>M</u> Sc < 0.05474	<u>Q</u> Ti < 0.00070
<u>M</u> Cd < 0.01642	<u>M</u> Hf < 0.01095	<u>Q</u> Ni < 0.00600	<u>M</u> Se < 0.04380	<u>M</u> W < 0.05474
<u>Q</u> Ca 0.00216	<u>M</u> Ho < 0.00274	<u>M</u> Nb < 0.00274	<u>Q</u> Si < 0.02000	<u>M</u> U < 0.01095
<u>M</u> Ce < 0.02737	<u>M</u> In < 0.05474	<u>n</u> Os	<u>M</u> Ag < 0.01095	<u>M</u> V < 0.01095
<u>M</u> Cs < 0.00164	<u>M</u> Ir < 0.02737	<u>M</u> Pd < 0.02737	<u>Q</u> Na < 0.10000	<u>M</u> Yb < 0.00547
<u>Q</u> Cr < 0.00150	<u>Q</u> Fe < 0.00200	<u>Q</u> P < 0.03000	<u>M</u> Sr < 0.00274	<u>M</u> Y < 0.21898
<u>M</u> Co < 0.01642	<u>M</u> La < 0.00274	<u>M</u> Pt < 0.01095	<u>Q</u> S < 0.10000	<u>M</u> Zn 0.00818
<u>M</u> Cu < 0.03285	<u>M</u> Pb < 0.01642	<u>Q</u> K 0.00180	<u>M</u> Ta < 0.03832	<u>M</u> Zr < 0.02737

M - Checked by ICP-MS

O - Checked by ICP-OES

i - Spectral Interference

n - Not Checked For

s - Solution Standard Element

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 ± 4 °C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98154; +3; 6; Al(H₂O)₆+3

Chemical Compatibility - Soluble in HCl, HNO₃, HF and H₂SO₄. Avoid neutral media. Soluble in strongly basic NaOH forming the Al(OH)₄(H₂O)₂- species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO₃); α- Al₂O₃ (Na₂CO₃ fusion in Pt0); γ- Al₂O₃ (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (sulfuric/peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES394.401 nm	0.05 / 0.006 µg/mL	1	atom	U, Ce
ICP-OES396.152 nm	0.03 / 0.006 µg/mL	1	atom	<u>Mo</u> , Zr, Ce
ICP-OES167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS27 amu	30 ppt	n/a	M+	12C15N, 13C14N, 1H12C14N, 11B16O, 54Cr2+, 54Fe2+

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 enclosed Material Safety Data sheet for information regarding this CRM.

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration

- QMI Certificate Number 010105

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

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

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 conditions 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.

11.3 Chemical Stability - Studies have been conducted on this or similar CRMs and it has been demonstrated that this CRM is chemically stable for a period of not less than two years provided the "Storage & Handling" conditions are followed that are described in section 7.0.

Certification Date: June 22, 2009

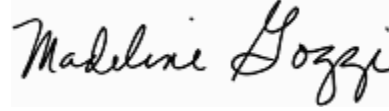
Expiration Date:

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Danny Feeny, Product Documentation Technician

Handwritten signature of Danny Feeny in black ink on a light gray background.

Certificate Approved By: Madeline Gozzi, Quality Control Supervisor

Handwritten signature of Madeline Gozzi in black ink on a light gray background.

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

Handwritten signature of Paul Gaines in black ink on a light gray background.