# Certificate of Analysis

## ISO Guide 34 Reference Material

**Product Number:** ICP-058
**Lot Number:** CP-3980

**Lot Issue Date:** 10-Aug 2016
**Expiration Date:** 30-Sep 2023

**Product Name:** Cerium ICP Standard

**Description:**
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

| Analyte | Starting Material | Lot Number | Purity (%) | Calculated Value | Traceability & Method |
|---|---|---|---|---|---|
| cerium | cerium(III) nitrate hydrate | RM09055 | 99.999% | 1001 ± 2 µg/mL | NIST SRM 3110; ICP-OES |

**Solvent:** 2% nitric acid in low TOC water (< 50 ppb)

**Non-Certified Values:**

**Density:** 1.0108 g/mL @ 20.00 ± 0.05°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 | |
| *___ | Ba | <0.005 ND | 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 D | n___ | Re | | *___ | Sn | <0.005 ND |
| n___ | Cs | | *___ | La | <0.005 ND | n___ | Rh | | *___ | Ti | <0.005 ND |
| *___ | Ca | <0.005 D | *___ | Pb | <0.005 ND | n___ | Rb | | n___ | W | |
| s___ | 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 | | *___ | Yb | <0.005 D |
| *___ | 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 | <0.005 ND | | | |

* - element checked; i - spectral interference; n – element not checked; D – element detected; ND – element not detected; s - standard element

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY



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

**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:**
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

**Homogeneity:**
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

**Intended Use:**
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

**Instructions for Use:**
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

**Hazards:**
Refer to the Safety Data Sheet for information regarding this RM.

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

**Maintenance of Certification:**
The real-time, long term stability of the RM may 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.

John Russo
President

Vincent Wang, Ph.D.
Director of QA/RA