



# Certificate of Analysis

**ULTRAGrade™ Solution**  
**Ruthenium ICP Standard**  
**1000 µg/mL**

**Catalog Number:** ICP-044  
**Lot Number:** P00017  
**Job Number:** J00014111  
**Lot Issue Date:** 01/09/2012  
**Expiration Date:** 02/28/2019

**Starting Material:** Ruthenium (III) Chloride Hydrate  
**Starting Material Purity:** 99.99%  
**Starting Material Lot No.:** BH01760  
**Matrix:** 5% hydrochloric acid in low TOC water (< 50 ppb)  
**Atomic Weight Ru:** 101.07

**Certified Value:** 1000 ± 2 µg/mL

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system. The analyte concentrations were verified by our ISO 17025 accredited laboratory to be within ± 2.5%, when compared to calibration standards independently prepared using second source SRM(s). The certified value and uncertainty value for each analyte is determined gravimetrically.

**Classical Wet Assay Method:** Theoretical, based on gravimetric measurements

## Confirmation by Inductively Coupled Plasma (ICP / ICP-MS)

ULTRA uses purified acids, 18 megohm double deionized water, calibrated Class A glassware & meticulously cleaned bottles in the manufacturing of ULTRAGrade standards. Balances used in the manufacturing of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

## Trace Metallic Impurities in Solution Standard in µg/mL:

* Al <0.020 D	* 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 ND	n Re	* Sn <0.005 ND
* Ca <0.020 D	* La <0.005 ND	n Rh	* Ti <0.005 ND
n Ce	* Pb <0.005 ND	n Rb	n W
n Cs	* Li <0.005 ND	s Ru	n U
* Cr <0.005 ND	n Lu	n Sm	* V <0.025 D
* Co <0.005 ND	* Mg <0.005 ND	n Sc	n Yb
* Cu <0.005 ND	* Mn <0.020 D	* 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 for  
ND - not detected

i - spectral interference  
D - detected

n - not checked for  
s - solution standard element

**Density of Solution** (measured at 22.00°C ± 0.05°C): 1.0131 g/mL



ISO 9001 Registered Quality System – TUV USA

William J. Leary  
Quality Assurance Manager