



# Certificate of Analysis

**ULTRAGrade™ Solution**  
**Ruthenium ICP / ICP-MS Standard**  
**10000 µg/mL**

**Catalog Number:** ICP-144  
**Lot Number:** CL-4519  
**Lot Issue Date:** 11/13/2014  
**Expiration Date:** 12/31/2021

**Starting Material:** ruthenium (III) trichloride trihydrate  
**Starting Material Purity:** 99.99%  
**Starting Material Lot #:** RM09654  
**Matrix:** 5% hydrochloric acid in low TOC water (< 50 ppb)  
**Atomic Weight Ru:** 101.1

**Certified Value:** 10000 ± 20 µg/mL

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001 registered quality system. The analyte concentration(s) were prepared and verified by an ISO Guide 34 / ISO 17025 accredited laboratory, and compared to calibration standards independently prepared using NIST SRM(s). The certified value and uncertainty value at the 95% confidence level for each analyte is determined gravimetrically.

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

**Confirmation by Inductively Coupled Plasma Spectroscopy (ICP / ICP/MS) vs. second source**

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 <0.005 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 <0.080 D	n Te
* Ba <0.005 ND	n Hf	* P <0.005 ND	n Tb
* Be <0.005 ND	n Ho	* Pt <0.050 D	* Tl <0.005 ND
* Bi <0.005 ND	* In <0.005 ND	* K <1.300 D	n Th
* B <0.005 ND	* Ir <0.100 D	n Pr	n Tm
* Cd <0.005 ND	* Fe <0.900 D	n Re	* Sn <0.005 ND
* Ca <0.180 D	* La <0.005 ND	n Rh <0.070 D	* 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 <0.005 ND
* Co <0.005 ND	* Mg <0.005 ND	n Sc	n Yb
* 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 <0.160 D	
* Gd <0.005 ND	* Ni <2.000 D	* 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 20.00°C ± 0.05°C):** 1.0306 g/mL



ISO 17025:2005  
Accredited  
A2LA  
Cert. No. 0851.01

ISO 9001:2000  
Registered  
TUV USA, Inc.  
Cert. No. 06-1004

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