



Certificate of Analysis

ULTRAgrade™ Solution
Hafnium ICP Standard
1000 µg/mL

Catalog Number: ICP-072
Lot Number: G00802A
Job Number: J00006234
Lot Issue Date: 11/12/2008
Expiration Date: 12/31/2015

Starting Material: Hafnium Oxide
Starting Material Purity: 99.999%
Starting Material Lot No.: NT04381
Matrix: 1% Hydrochloric acid in low TOC water (< 50 ppb)
Atomic Weight Hf: 178.5

Certified Value: 1000 ± 2 µg/mL

This Certified Reference Material (CRM) was manufactured and verified in accordance with ULTRA's ISO 9001:2000 registered quality system, and the analyte concentrations were verified by our ISO 17025 accredited laboratory. The certified value and uncertainty value, at the 95% confidence level, for each analyte determined gravimetrically.

Classical Wet Assay Method: Theoretical, based on gravimetric measurements

Confirmation by Inductively Coupled Plasma Spectroscopy (ICP / ICP-MS) vs. NIST SRM 3122

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/NCCL 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	<0.005	ND
* Ba	<0.005	ND	s Hf			* P	<0.005	ND
* Be	<0.005	ND	n Ho			* Pt	<0.005	ND
* Bi	<0.005	ND	* In	<0.005	ND	* K	<0.005	ND
* B	<0.005	ND	n Ir			n Pr		n Tm
* Cd	<0.005	ND	* Fe	<0.005	ND	n Re		* Sn
* Ca	<0.020	D	* La	<0.005	ND	n Rh		* Ti
n Ce			* Pb	<0.005	ND	n Rb		n W
n Cs			* Li	<0.005	ND	n Ru		n U
* Cr	<0.005	ND	n Lu			n Sm		* V
* 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 Dy			* Hg	<0.005	ND	* Si	<0.005	ND
* Er	<0.005	ND	* Mo	<0.005	ND	* Ag	<0.005	ND
* 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 23.0°C ± 0.5°C): 1.002 g/mL



ISO 9001 Registered Quality System – TUV USA


William J. Leary
Quality Assurance Manager