

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICP-072
Lot Number: CS-0670

Lot Issue Date: 14-Feb 2018
Expiration Date: 31-Mar 2025

Product Name: Hafnium 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 (%)	Analyte Concentration	Traceability & Method
hafnium	hafnium oxide	RM11371	99.99%	1000 ± 2 µg/mL	NIST SRM 3122; ICP-MS

Solvent: 1% hydrochloric acid with trace hydrofluoric acid in low TOC water (< 50 ppb)

Non-Certified Values:

Density: 1.0019 g/mL @ 20.00 ± 0.05°C

Trace Metallic Impurities in Solution Standard in µg/mL

* ___ Al <0.025 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	s ___ 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	* ___ Th <0.005 ND
* ___ B <0.005 ND	n ___ Ir	n ___ Pr	n ___ Tm
* ___ Cd <0.005 ND	* ___ Fe <0.005 ND	* ___ Re	* ___ Sn <0.005 ND
* ___ Cs <0.005 ND	* ___ La <0.005 ND	* ___ Rh <0.005 ND	* ___ Ti <0.025 D
* ___ Ca <0.005 ND	* ___ Pb <0.005 ND	n ___ Rb	* ___ W
n ___ 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	n ___ Yb
* ___ Cu <0.005 ND	* ___ Mn <0.005 ND	* ___ Se <0.005 ND	n ___ Y
n ___ Dy	* ___ Hg <0.005 ND	* ___ Si <0.025 D	* ___ Zn <0.005 ND
* ___ Er <0.005 ND	* ___ Mo <0.005 ND	* ___ Ag <0.005 ND	n ___ Zr <0.075 D
* ___ 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

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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
Monica Bourgeois
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