

Certificate of Analysis

Product Description:

Name:	Hafnium	Source Material:	Hafnium Metal
Part Number:	10M22-3	Material Purity:	99.2%
Lot Number:	SAMPLE	Matrix:	2% (v/v) HF + 4% (v/v) HNO ₃

Certified Value: 10000 µg/mL ± 40 µg/mL

The Certified value is based on gravimetric and volumetric preparation, and confirmed against SRM 3122 (lot number 080430) by inductively coupled plasma optical emission spectrometry (ICP-OES) using an internal laboratory-developed method. The uncertainty in the certified value is calculated for a 95% confidence interval and coverage factor *k* is about 2.

Density: 1.031 g/mL ± 0.002 g/mL @ 22.1°C

Uncertified Values:

Trace Metal Impurity Scan: The data reported are based upon a scan of this specific lot at 10000 µg/mL via ICP analysis. The values are reported in µg/L.

Ag	< 270	Cu	< 0.5	Li	< 0.1	Rb	< 0.1	Th	< 0.1
Al	< 180	Dy	< 0.1	Lu	< 0.1	Re	< 0.1	Ti	100
As	< 0.3	Er	< 0.1	Mg	< 3	Rh	< 0.1	Tl	< 0.1
Au	na	Eu	< 0.1	Mn	< 0.5	Ru	< 0.1	Tm	< 0.1
B	< 50	Fe	1500	Mo	< 0.1	Sb	< 0.1	U	< 0.5
Ba	< 0.1	Ga	< 0.1	Na	< 30	Sc	< 0.1	V	< 0.3
Be	< 0.1	Gd	< 0.1	Nb	< 0.1	Se	< 0.5	W	< 0.1
Bi	< 10	Ge	< 0.1	Nd	< 0.1	Si	< 500	Y	< 0.1
Ca	< 5	Hf	M	Ni	< 10	Sm	< 0.1	Yb	na
Cd	< 0.1	Ho	< 0.1	Os	na	Sn	< 5	Zn	< 0.5
Ce	< 0.1	In	< 0.1	Pb	< 0.3	Sr	< 0.1	Zr	60000
Co	< 0.3	Ir	na	Pd	< 0.1	Ta	< 100		
Cr	40	K	< 5	Pr	< 0.1	Tb	< 0.1		
Cs	< 0.1	La	< 0.1	Pt	na	Te	< 0.1	na - not analyzed	

Preparation Information:

The standard solution is prepared using high purity materials and assayed by analytical methods for conformity prior to use. This standard was prepared using the methods developed at NIST for SRM Spectrometric Standard Solutions under appropriate laboratory conditions.

Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water.

Stability of this product is based upon rigorous short term and long term testing of the solution for the certified value. This testing includes, but is not limited to, the effect of temperature and packaging on the product.

Intended Use:

Lot No.: **Error! Reference source not found.**

Rev. No.: 5.2.0

Page 1 of 2

This Certified Reference Material (CRM) is intended for use as a calibration standard for the quantitative determination of hafnium, calibration of instruments such as ICPOES, ICPMS, AAS and XRF, and validation of analytical methods. It also can be used in EPA, ASTM and other methods.

Traceability Information:

The traceability of this standard is maintained through an unbroken chain of comparisons to appropriate standards with suitable procedure and measurement uncertainties. The maintenance of the base and derived units of International System of Units (SI) with traceability of measurement results (contemporary metrology) to SI ensures their comparability over time as follows.

a. **Standard Weight and Analytical Balance**

The standard weights (NBS weights Inventory No 20231A) are calibrated every two years by South Carolina Metrology Laboratory that is a participant in "NIST Weights and Measures Measurement Assurance Program" with a certificate of measurement traceability to NIST primary standards.

The balances are calibrated yearly by the ISO 17025 accredited metrology service, and are verified weekly by an in-house method using standard weights.

b. **Volumetric Device**

The calibration of volumetric vessels is checked annually using the ASTM method E542.

c. **Thermometer**

The standard thermometers are calibrated every year by the ISO 17025 accredited metrology service. The thermometers used in-house are verified against the standard thermometers yearly.

d. **Calibration Standards:**

The Calibration Standard is directly traceable to SRM 3100 Series Spectrometric Standard Solutions.

Packaging and Storage Conditions:

The standard is packaged in a pre-cleaned polyethylene bottle. To maintain the integrity of this product, the solution should be kept tightly capped and stored under normal laboratory conditions.

Refer to Material Safety Datasheet (MSDS) for hazardous information.

Expiration Information:

The expiry date is guaranteed to be valid for eighteen months from the shipping date provided. For this reason, standards from the same lot may have different expiration dates.

Preparation Date: June 9, 2015

Shipped Date:

Expiration Date:

Certificate Issue Date: June 16, 2015

Quality Information:



ISO/IEC 17025:2005 Accreditation
Certificate Number AT-1529



Angel Sellers
Quality Manager



ISO Guide 34:2009 (RMP) Accreditation
Certificate Number AR-1436

NOTICE: HPS products are intended for laboratory use only. All products should be handled and used by trained professional personnel. The responsibility for the safe handling and use of these products rests solely with the buyer and/or user. The data and information as stated was furnished by the manufacturer of the product. The information provided in this certificate pertains only to the lot number specified. None of the information provided in this certificate may be used, reproduced or transmitted in any form or by any means without written approval from High Purity Standards.

Lot No.: **Error! Reference source not found.**

Rev. No.: 5.2.0

Page 2 of 2

High-Purity Standards is certified to ISO 9001:2008 and accredited to ISO/IEC 17025:2005 and ISO Guide 34:2009.