

Certificate of analysis

Product No.: 14396
Niobium Plasma Standard

Certified Concentration of Nb: $9989 \pm 54 \mu\text{g/mL}$ ($9781 \pm 53 \mu\text{g/g}$)
Matrix: 2% HF

Lot No.: 181648W
Expiry Date: June 30, 2019

Intended Use: This solution is intended for use as a certified reference material or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), flame or furnace atomic absorption spectroscopy (AA or GFAA), x-ray fluorescence spectroscopy (XRF), and other techniques for elemental analysis.

Certification & Traceability: This CRM was manufactured and certified under an ISO 9001, ISO/IEC 17025, and ISO Guide 34 quality management system. This CRM was prepared to a nominal concentration of $10,000 \mu\text{g/mL}$ by gravimetric methods using 99.9985% pure niobium pentachloride (NbCl_5) dissolved in high purity hydrofluoric acid (HF) and diluted with filtered ($0.22 \mu\text{m}$), 18 M-ohm deionized water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration and uncertainty were determined using the "High Performance ICP-OES" protocol developed by NIST and both the certified concentration and uncertainty values are traceable to NIST SRM 3137, lot #120629. The uncertainty associated with the certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of $k=2$.

Uncertified Values: ICP-MS was used to determine trace metal concentrations for this product (nd = not determined).

Trace Concentrations ($\mu\text{g/L}$)

Ag	<10	Ce	<2	Gd	<2	Lu	<2	Pb	<10	Se	<20	Tl	<5
Al	22	Co	<10	Ge	<5	Mg	<50	Pd	<5	Si	<1000	Tm	<2
As	<20	Cs	<5	Hf	<2	Mn	<10	Pr	<2	Sm	<2	U	<5
Au	22	Cr	18	Hg	<5	Mo	<5	Pt	<5	Sn	<5	V	<10
B	<50	Cu	<10	Ho	<2	Na	<250	Rb	<5	Sr	<10	W	<5
Ba	<10	Dy	<2	In	nd	Nb	MAJOR	Re	<2	Ta	987	Y	<5
Be	<5	Er	<2	Ir	<2	Nd	<2	Rh	<5	Tb	<5	Yb	<2
Bi	34	Eu	<2	K	<250	Ni	<20	Ru	<5	Te	<10	Zn	<20
Ca	<250	Fe	<100	La	<5	Os	<5	Sb	<5	Th	<5	Zr	<5
Cd	<5	Ga	<5	Li	<20	P	<1000	Sc	<50	Ti	<20		

Instructions for Use: We recommend that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy the analyst should: (1) use only pre-cleaned containers and transferware, (2) not pipette directly from the CRM's original container, (3) use a minimum sub-sample size of $500 \mu\text{L}$, (4) make dilutions using calibrated balances or certified volumetric class A flasks and pipettes, (5) dilute with the same matrix as the original CRM, and (6) never pour used product back into the original container. The solution should be kept tightly capped and stored under normal laboratory conditions. Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

Period of Validity: Alfa Aesar guarantees the accuracy of this Specpure® solution until the expiry date shown above, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

1/4/2017

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Hazard Information: Refer to the Material Safety Data Sheet (MSDS).

Homogeneity: This solution was determined to be homogeneous by procedures consistent with the requirements of ISO Guide 34 and ISO Guide 35. Replicate samples of the finished solution were analyzed to confirm its homogeneity, in accordance with QSP 6-13 Assessment of Homogeneity and Stability. To ensure homogeneity, users should not take a smaller sub-sample than specified in the Instructions for Use, as doing so will invalidate the certified values and uncertainties.

Further Information: Please contact Alfa Aesar for further information about this CRM.

Quality Certifications: This CRM was prepared under a quality management system that is:

- Registered to ISO 9001 – Quality Management Systems – Requirements (TUV USA Cert. No. 12-1280)
- Accredited to ISO Guide 34 – General Requirements for the Competence of Reference Material Producers (A2LA Cert. No. 2848.02)
 - ISO Guide 34 references additional requirements specified in ISO Guide 31 and ISO Guide 35
- Accredited ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (A2LA Cert. No. 2848.01)

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