

National Certified Reference Material (NCRM)

Code: GBW04511



Reference Material Certificate

Isotopically Enriched ^{97}Mo Spike Solution

Batch Number:



Certification Date:

Period of Validity:



Reference Material Producer: National Institute of Metrology

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Version: 2.0



This CRM is intended for the measurement of Mo content when utilizing the isotope dilution mass spectrometry, which ensured the traceability of the measurement results. This CRM could also be used for the evaluation of analysis methods for the determination of Mo content.

1. Sample Preparation

The raw material of this CRM is enriched $^{97}\text{MoO}_3$ powder with high purity (99.99%) . After the material was weighed with balance, it was dissolved with highly pure ammonia; after dryness, it was diluted to a certain concentration by 2% nitric acid. Finally, the CRM solution was sealed in 10 mL ampoule bottles.

2. Traceability and Characterization Method

The amount content of Mo in this CRM was determined and certified by the isotope dilution mass spectrometry. The isotopically enriched spike solution with known Mo isotopic composition was gravimetrically mixed with a primary standard solution for Mo amount content; therefore, the Mo content in the spike solution could be calculated based on an isotope ratio measurement. The Mo isotope ratios in this CRM were analyzed and certified by means of calibrated mass spectrometry. The MC-ICP-MS in NIM was used to determine Mo isotope ratios in this CRM. The correction solutions were gravimetrically prepared with enriched ^{92}Mo , ^{94}Mo , ^{95}Mo , ^{96}Mo , ^{97}Mo , ^{98}Mo and ^{100}Mo isotopic materials, whose purities and isotopic compositions had been accurately measured. By using these calibration solutions, the correction factors for mass bias were obtained, and then the CRM sample was analyzed by the calibrated mass spectrometer.

The traceability of the certified isotope ratio values is guaranteed by using the primary measurement method – calibrated mass spectrometry. Through the utilize of the enriched isotopic materials with accurate purities and isotopic compositions, and the calibrated balance for gravimetrically preparing calibration solutions, the property values of this CRM are traceable to SI unit kilogram (kg) and mole (mol).

3. Property Values and Uncertainties

The property values and expanded uncertainties of Mo content and isotope ratios are as follows:

Code	Name	Amount content ($\mu\text{g/g}$)		Uncertainty ($\mu\text{g/g}$), ($k=2$)
GBW04511	Isotopically Enriched ^{97}Mo Spike Solution	8.43		0.04
		Isotope ratio		Uncertainty ($k=2$)
		$^{92}\text{Mo}/^{97}\text{Mo}$	0.002212	0.000009
		$^{94}\text{Mo}/^{97}\text{Mo}$	0.002013	0.000007
		$^{95}\text{Mo}/^{97}\text{Mo}$	0.004936	0.000007
		$^{96}\text{Mo}/^{97}\text{Mo}$	0.013118	0.000014

		$^{98}\text{Mo}/^{97}\text{Mo}$	0.03589	0.00003
		$^{100}\text{Mo}/^{97}\text{Mo}$	0.003249	0.000003

The atomic weight of Mo in the spike solution is 96.911

The coverage factors were chosen to obtain an approximate 95 % level of confidence. The uncertainty evaluation considered sources from characterization, between-unit homogeneity and stability.

4. Homogeneity and Stability Assessment

According to national technical specification of JJF1343 (equivalent to ISO Guide 35), homogeneity and stability study for this certified reference material were carried out through random sampling of sub-packaged samples followed by MC-ICP-MS. The results demonstrated good homogeneity and stability of this CRM.

The period of validity of this CRM is 3 years since the date of certification. The stability of this CRM is regularly monitored by NIM, during this period the customer will be informed of any change of the certified values just-in-less-time.

5. Packaging, Storage and Use

Packaging: This CRM is packaged in glass ampoule bottles. Each bottle contains 5 mL solution.

Storage: This CRM should be kept in dark and dry place

Use: Prior to use, it should be balanced to room temperature (20 ± 2) °C and thoroughly mixed by inverting the ampoule to reach sufficient homogeneity. Contamination should be strictly prevented during use.

Statement

1. The reference material is only for lab study and analytical testing. In case of any complaint due to the improper use or storage by the user, the institute will bear no responsibility.
2. After receiving it, please immediately check variety, quantity and packaging. Relevant compensation is only limited to the reference material itself.
3. The institute is only responsible for the complete certificate affixed with the “Dedicated Seal for Reference Material of National Institute of Metrology”. Please properly keep this certificate.
4. To obtain more application related information, please contact the Department of Technical Consultation.

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Website: www.nim.ac.cn, www.ncrm.org.cn (National Sharing Platform for Reference Materials)



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