



SPEXertificate®

Certificate of Reference Material



Catalog Number: PLCU2-2Y

Lot No. 28-83CUY

Description: 1000 µg/mL Copper

Matrix: 2% HNO₃

This ASSURANCE® Certified Reference Material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICP-OES, DCP, AA, ICP-MS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 999 µg/mL ±5 µg/mL ← 证书赋值和不确定度

Certified Value is Traceable to: 3114* ← 溯源的美国NIST标准参考物
 * - indicates NIST SRM † - indicates SPEX CertiPrep CRM (when NIST SRM is not available)

The CRM is prepared gravimetrically using high purity Copper Metal, Lot# 10221A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 µg/mL ← 主量元素的经典湿法测量值

Method: EDTA titration using PAN as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928

Instrumental Analysis by ICP Spectrometer: 1001 µg/mL ← 主量元素的ICP-OES测量值

Uncertified Properties

Density: 1.011 g/mL @ 20.0°C

Trace Metallic Impurities in the Actual Solution via ICP-MS Analysis: ← 标液中杂质元素ICP-MS测量值

Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL
Ag	0.005	Cr	<0.001	Ho	<0.001	Nb	<0.001	Ru	<0.001	Th	<0.001
Al	<0.002	Cs	<0.001	In	<0.001	Nd	<0.001	Sb	<0.001	Ti	<0.001
As	<0.001	Dy	<0.001	Ir	<0.001	Ni	<0.001	Sc	<0.001	Tl	<0.001
Au	<0.001	Er	<0.001	K	<0.1	P	<0.2	Se	<0.002	Tm	<0.001
B	<0.001	Eu	<0.001	La	<0.001	Pb	0.005	Si	<0.1	U	<0.001
Ba	<0.001	Fe	0.02	Li	<0.001	Pd	<0.001	Sm	<0.001	V	<0.001
Be	<0.001	Ga	<0.001	Lu	<0.001	Pr	<0.001	Sn	0.003	W	<0.001
Bi	<0.001	Gd	<0.001	Mg	<0.001	Pt	<0.001	Sr	<0.001	Y	<0.001
Ca	<0.01	Ge	<0.001	Mn	<0.001	Rb	<0.001	Ta	<0.001	Yb	<0.001
Cd	<0.001	Hf	<0.001	Mo	<0.001	Re	<0.001	Tb	<0.001	Zn	0.02
Ce	<0.001	Hg	<0.001	Na	0.004	Rh	0.002	Te	<0.001	Zr	<0.001
Co	<0.001										

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% of the certified value. This includes uncertainty components due to preparation, homogeneity by the most precise method, and short-term and long-term stability. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and stored under ambient laboratory conditions.

Date of Certification JUN -- 2025 Certifying Officer Katherine Cullinan
 Katherine Cullinan, QC Manager

Report of Certification

This Certified Reference Material (CRM) has been prepared and certified under an ISO 9001 (certified by DQS), ISO/IEC 17025 (accredited by A2LA) and ISO 17034 (accredited by A2LA) quality system consistent with the following guides:

- ISO 9001: Quality management systems – Requirements
- ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
- ISO 17034: General requirements for the competence of reference material producers
- ISO Guide 30: Reference Materials – Selected terms and definitions
- ISO Guide 31: Reference Materials – Contents of certificates, labels, and accompanying documentation
- ISO Guide 35: Reference Materials – Guidance for characterization and assessment of homogeneity and stability
- Guide to the Expression of Uncertainty in Measurement, 2008
- EURACHEM/CITAC Guide: Qualifying Uncertainty in Analytical Measurement – Third Edition
- NIST Technical Note 1297

Material Source:

All analytes and matrix materials are obtained and verified by Spex CertiPrep from pre-qualified vendors as per ISO 9001, ISO/IEC 17025 and ISO 17034 guidelines. Vendor identifications are proprietary; however, sources of all materials used in the preparation and testing of Spex CertiPrep CRMs are tracked and documented. For further assistance, please contact Sales Support at USMet-CRMSales@antylia.com.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required, the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. Do not return excess solution to the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware. See SDS for health and safety information.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles (where appropriate), and Class A/calibrated volumetrics have been used in all preparations.

Homogeneity:

The homogeneity of the CRM has been confirmed by procedures consistent with ISO/IEC 17025, ISO 17034, and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed to prove homogeneity in accordance with our internal procedure 4600-HOMOGEN-1A. Since the product is highly homogeneous, any sample size taken for analysis would be within the uncertainty budget. This is consistent with the intended use of the CRM.

Statistical Estimator and Confidence Limits:

The certified value 'X' listed on the reverse of this document is at the 95% level of confidence and can be expressed as:

- $X = x \pm U$ where X = certified value, U = expanded uncertainty, x = property value
- $U = k u_c$ where $k = 2$ is the coverage factor at the 95% confidence level
- u_c = combined standard uncertainty obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Report:

All certified values reported were derived from the Certification Report, Spex CertiPrep's traceability documentation, identified by the lot number of this CRM. During the stated period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution. For further assistance, please contact Sales Support at USMet-CRMSales@antylia.com.

Legal Notice:

Spex CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against Spex CertiPrep, LLC. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this Reference Material shall be greater than the purchase price. In no event shall Spex CertiPrep, LLC. be liable for any loss of profits or any incidental, special, or consequential damages.