

**Catalog Number:** CLMS-2N  
**Description:** Multi-element Solution 2  
**Matrix:** 5% HNO3

**Lot No.** CL5-199MKBY

The **CLARITAS PPT**<sup>®</sup> 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 US EPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single-element concentrates of individual elements using Class A laboratory ware to give precise concentrations. See side 2 for details of certification.

### Instrumental Analysis by ICP Spectrometer:

Analyte	Labeled	Certified	Uncertainty	SRM	Analyte	Labeled	Certified	Uncertainty	SRM
Ag	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3151*	K	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3141a*
Al	10 µg/mL	9.89 µg/mL	± 0.05 µg/mL	3101a*	Li	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3129a*
As	10 µg/mL	9.92 µg/mL	± 0.05 µg/mL	3103a*	Mg	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3131a*
Ba	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3104a*	Mn	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3132*
Be	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3105a*	Na	10 µg/mL	9.91 µg/mL	± 0.05 µg/mL	3152a*
Bi	10 µg/mL	9.97 µg/mL	± 0.05 µg/mL	3106*	Ni	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3136*
Ca	10 µg/mL	9.94 µg/mL	± 0.05 µg/mL	3109a*	Pb	10 µg/mL	9.91 µg/mL	± 0.05 µg/mL	3128*
Cd	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3108*	Rb	10 µg/mL	9.93 µg/mL	± 0.05 µg/mL	3145a*
Co	10 µg/mL	9.95 µg/mL	± 0.05 µg/mL	3113*	Se	10 µg/mL	9.98 µg/mL	± 0.05 µg/mL	3149*
Cr	10 µg/mL	9.93 µg/mL	± 0.05 µg/mL	3112a*	Sr	10 µg/mL	9.97 µg/mL	± 0.05 µg/mL	3153a*
Cs	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3111a*	Tl	10 µg/mL	9.88 µg/mL	± 0.05 µg/mL	3158*
Cu	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3114*	U	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3164*
Fe	10 µg/mL	10.3 µg/mL	± 0.05 µg/mL	3126a*	V	10 µg/mL	9.99 µg/mL	± 0.05 µg/mL	3165*
Ga	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3119a*	Zn	10 µg/mL	10.0 µg/mL	± 0.05 µg/mL	3168a*
In	10 µg/mL	9.87 µg/mL	± 0.05 µg/mL	3124a*					

\* - Indicates NIST SRM      † - Indicates Spex CertiPrep CRM (when NIST SRM is not available)  
 Spex CertiPrep Reference Multi: Lot # CL3-151MKB, CL4-108MKB

### Trace Metallic Impurities in the Actual Solution via ICP-MS Analysis:

Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL
Au	< 0.04	Ge	< 0.7	Mo	0.2	Re	< 0.01	Sm	0.9	Ti	< 6
B	< 2	Hf	< 0.08	Nb	< 0.06	Rh	0.7	Sn	< 0.9	Tm	0.05
Ce	0.1	Hg	< 0.2	Nd	< 0.01	Ru	< 1	Ta	< 0.1	W	< 0.3
Dy	< 0.01	Ho	< 0.01	P	< 200	Sb	< 0.04	Tb	< 2	Y	6
Er	< 0.01	Ir	0.08	Pd	< 5	Sc	< 0.4	Te	< 1	Yb	< 0.01
Eu	< 0.01	La	0.07	Pr	< 0.01	Si	< 200	Th	0.01	Zr	< 0.1
Gd	< 0.02	Lu	< 0.02	Pt	< 0.01						

Balances are calibrated regularly with weight sets traceable to NIST #s 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, measurement, homogeneity, short-term, and long-term stability. No measured concentration of any individual component exceeds ± 2% of the labeled value. This guarantee is valid for a period of one year from the date of certification only when the material is unopened and stored under ambient laboratory conditions.

Date of Certification: \_\_\_\_\_

Certifying Office: \_\_\_\_\_  
 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 CRMSales@spex.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 CRMSales@spex.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.