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CERTIFICATE OF ANALYSIS

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories." Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).

ACCREDITED
Testing Laboratory
Certificate 883.01

ACCREDITED
Reference Material Producer
Certificate 883.02

2.0 PRODUCT DESCRIPTION

Product Code: **Water QC Reference Material**

Catalog Number: QCP–RAIN

Lot Number: P2-RH681361

Matrix: H_2O

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Analyte	Certified Value	Analytical Method	NIST Traceability	Acceptance Limits
pH @ 20˚C	3.73 ± 0.03 units	Standard Methods 4500-H^+B - Modified	SRM 185i	3.77 - 3.70 units
Conductivity @ 20˚C	96.3 ± 0.7 µmhos/cm	Standard Methods 2510B - Modified	SRM 999c	107.2 - 85.4 µmhos/cm
Conductivity @ 25˚C	106.5 ± 0.7 µmhos/cm	Standard Methods 2510B - Modified	SRM 999c	118.5 - 94.6 µmhos/cm
Chloride	2.728 ± 0.031 mg/L	Ion Chromatography	SRM 3182	3.525 - 1.931 mg/L
Fluoride	0.7939 ± 0.0101 mg/L	Ion Chromatography	SRM 3183	1.026 - 0.5620 mg/L
Nitrate	4.501 ± 0.050 mg/L	Ion Chromatography	SRM 3185	5.816 - 3.187 mg/L
Sulfate	10.13 ± 0.11 mg/L	Ion Chromatography	SRM 3181	13.09 - 7.17 mg/L
Ammonium	1.368 ± 0.006 mg/L	Ion Chromatography	SRM 194a	1.768 - 0.969 mg/L
Calcium	0.4604 ± 0.0023 mg/L	ICP	SRM 3109a	0.5949 - 0.3259 mg/L
Magnesium	0.4409 ± 0.0024 mg/L	ICP	SRM 3131a	0.5697 - 0.3121 mg/L
Potassium	1.072 ± 0.006 mg/L	ICP	SRM 3141a	1.385 - 0.759 mg/L
Sodium	0.9644 ± 0.0055 mg/L	ICP	SRM 3152a	1.246 - 0.6828 mg/L

DENSITY OF SOLUTION (measured at 20 $\pm$ 4˚C): 0.998 **g/mL**

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two Methods

Certified Value, $X_{CRM/RM}$, where two methods of characterization are used is the weighted mean of the two results:

$X_{CRM/RM} = [(w_a)(X_a) + (w_b)(X_b)]$

X_a = mean of Assay Method A with standard uncertainty $u_{char\ a}$

X_b = mean of Assay Method B with standard uncertainty $u_{char\ b}$

w_a and w_b = the weighting factors for each method calculated using the inverse square of the variance:

$w_a = (1/u_{char\ a})^2 / ((1/u_{char\ a})^2 + (1/u_{char\ b})^2)$

$w_b = (1/u_{char\ b})^2 / ((1/u_{char\ a})^2 + (1/u_{char\ b})^2)$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a\&b} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2 in all cases at Inorganic Ventures

$u_{char\ a\&b} = [(w_a)^2 (u_{char\ a})^2 + (w_b)^2 (u_{char\ b})^2]^{1/2}$ where $u_{char\ a}$ and $u_{char\ b}$ are the square root of the sum of the squares of errors from characterization which include instrument measurement, density, NIST SRM uncertainty, weighing, and volume

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$X_{CRM/RM}$ = mean of Assay Method A with standard uncertainty $u_{char\ a}$

CRM/RM Expanded Uncertainty (±) = $U_{CRM/RM} = k\,(u^2_{char\ a} + u^2_{bb} + u^2_{lts} + u^2_{ts})^{1/2}$

k = coverage factor = 2 in all cases at Inorganic Ventures

$u_{char\ a}$ = square root of the sum of the squares of the errors from characterization which include instrumental measurement, density, NIST SRM uncertainty, weighing, and volume

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

No correction has been applied for transpiration that will occur after the CRM/RM bottle has been removed from the sealed aluminized bag. See Section 7.0 (Instructions for the Correct Use of this Reference Material) for more information.

4.0 TRACEABILITY TO NIST

4.1 Thermometer Calibration

-All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

-All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

-An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL) - N/A

6.0 INTENDED USE

-For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

-For optimum conditions, this product should be frozen before opening. If this is not possible, then it must be stored at 4˚C. After the product is brought to room temperature, it should be used within 48 hours.

-While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur. It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

-After opening the sealed TCT bag keep cap tightly sealed when not in use. Do not pipette from the container. Do not return removed aliquots to container.

-For more information, visit www.inorganicventures.com/TCT.

7.2 Preparation Instructions

Allow the solution to come to room temperature before using. No dilution is required.

8.0 HAZARDOUS INFORMATION

-Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

-This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

-Chemical Testing – Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

-Reference Material Producer – Accredited / A2LA Certificate Number 883.02

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 11, 2020

-The certification is valid within the measurement uncertainty specified, provided the CRM/RM is stored and handled in accordance with instructions given in Section 7.1. This certification is nullified if instructions in Section 7.1 are not followed or if the CRM/RM is damaged, contaminated or otherwise modified.

11.2 Period of Validity

-Sealed TCT Bag Open Date: ________________________________

-This CRM/RM should not be used longer than one year from the date of opening the sealed TCT bag or after the date given in Section 11.3, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instruction given in Section 7.1.

11.3 Lot Expiration Date

January 11, 2024

-The date after which this CRM/RM should not be used (See Section 11.2)

-The lot expiration date reflects the period of time the stability of a CRM/RM can be supported by long-term stability studies conducted on properly stored and handled CRM/RMs.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:

Uyen Truong
Supervisor, Product Documentation

Certificate Approved By:

Michael Booth
Manager, Quality Control

Certifying Officer:

Paul Gaines
PhD., Senior Technical Director