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Certificate of Analysis

CERTIFIED REFERENCE MATERIAL

Solution of Ruthenium(Ru) concentration 1000 mg/l Matrix: 5% HCl

Lot N: XXXXXX
Barcode: XXXXXXXX

Ref N: C048.5CP.L25

Certification Date:XXXXXX

Component	Certified Value and uncertainty [mg/l]	Metrological traceability
Ru	1004.5 ± 6.4 (a)	SPX CRM No PLRU3-2M Lot 20-182RUM

Notes:
(a) WQP 5.15.1.1 *The certified value was obtained using ICP/OES or ICP/MS calibration*

Density* 1.029 g/cm^3 at 20°C

Starting Material, Purity*	Batch
$RuCl_3$ 99.99%	82088484

* *These values are not certified*

Storage Conditions: Store under normal laboratory conditions, at temperatures between 15° to 25°C

Shelf-life: XXXXXXXXXX

Date of opening: ……..

(Recommended period of use should not exceed 12 months from date of opening)

Concept of Certification and traceability statement:

This certified reference material is produced using a high purity starting material, acid from sub-boiling and 18 MOhm deionized water.
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA 4/02
Property of the result of a measurement whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties (ISO VIM)
The metrological traceability is assured through calibration on ICP/OES . The calibration curve is drawn using a series of standard solutions prepared from a certified reference material traceable to SI of NIST (SRM) or BAM (CRM). All contributions in relation to the certification of standard solutions are considered when evaluating the uncertainty.
The measurement results are traceable to SI. All analytical balances used for the preparation of the solution are calibrated yearly under an in-house procedure with analytical weights, traceable to DKD, and are checked daily.
Class A laboratory glassware is used.
The results from temperature measurement are traceable to SI. The thermometers used for solution's calibration are calibrated from an ISO 17025 accredited laboratory. The ambient conditions are controlled with a hygrometer calibrated from an ISO 17025 accredited laboratory.

Intended use: *For Laboratory Use Only*

Calibration of ICP/OES, AAS
Preparation of "working reference samples"
This statement is not intended to restrict the use for other purposes.

Validation of analytical methods
Detection limit and linearity studies

Instructions for the correct use of this reference material:

This certified reference material can be used directly or can be diluted in an appropriate high purity matrix. Only a clean class A glassware should be used. Do not pipet from container. Obtained concentration (in mg/l) after dilution is a result from the multiplication of certified value of CRM concentration and the CRM's volume used for dilution and divided into the flask's volume used for dilution.

Stability and storage:

This CRM is with a guaranteed stability until ±0.5% of the certified concentration within its shelf life. Stability is guaranteed, provided that the solution is kept in its original packaging, tightly closed stored, as written in the section: Storage Conditions. The laboratory performs stability tests according to MQP 5.14.1 therefore solutions with one and the same bar-code number might have different expiration dates.

Hazardous situation:

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The normal laboratory safety precautions should be observed when working with this CRM. Further details for the handling of this CRM are available as safety data sheet.

Level of homogeneity:
The material was tested for homogeneity by analyzing randomly selected samples according to an in-house procedure. The level of homogeneity proved satisfactory for a sample volume of 20 ml. The uncertainty incorporates the sample standard deviation combined with the uncertainty calculated from homogeneity and stability studies.
To ensure sufficient homogeneity of the sample prior to use thoroughly mix by inversion.

Names of certifying officers:

Laboratory: Tihomir Stoyanov

Manager: Krassimira Taralova

This document QF 5.17.1/1 version 1 is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31, ISO Guide 35,and Eurachem / CITAC Guides

This certificate relates solely to the lot number given above.
All processes (including generating of this certificate) are completely controlled by the specialized Computer-Aided-Manufacturing (CAM) software.

This Certified Reference Material was produced under a quality management system that is:
- Registered to ISO 9001 Quality Management System (Lloyd's Register Quality Assurance Ltd Cert No 0039638)
- Accredited according to ISO/IEC 17025 – Testing (ANAB Cert No AT-1836)
- Accredited according to ISO 17034 - Reference Material Producer (ANAB Cert No AR-1835)

Trace impurities in the actual solution reported in ppm:

(all values below are nominal and not certified)

Ag	<0.0038	Cu	<0.0009	La	<0.0024	Pt	<0.0097	Tb	<0.022
Al	<0.0018	Dy	<0.0054	Li	<0.0001	Rb	<0.063	Te	<0.031
As	<0.016	Er	<0.0035	Lu	<0.0062	Re	<0.0081	Th	<0.014
Au	<0.016	Eu	<0.0039	Mg	<0.0006	Rh	<0.0038	Ti	<0.0012
B	<0.0078	Fe	<0.0025	Mn	<0.001	Ru	*	Tl	<0.028
Ba	<0.0005	Ga	<0.020	Mo	<0.0024	S	<0.071	Tm	<0.0023
Be	<0.0001	Gd	<0.0028	Na	<0.007	Sb	<0.020	U	<0.45
Bi	<0.016	Ge	<0.020	Nb	<0.0066	Sc	<0.0016	V	<0.0018
Ca	<0.004	Hf	<0.0032	Nd	<0.0058	Se	<0.023	W	<0.017
Cd	<0.0012	Hg	<0.024	Ni	<0.0061	Si	<0.037	Y	<0.0007
Ce	<0.0085	Ho	<0.0053	P	<0.048	Sm	<0.0058	Yb	<0.0003
Co	<0.0028	In	<0.098	Pb	<0.021	Sn	<0.050	Zn	<0.0032
Cr	<0.0014	Ir	<0.0061	Pd	<0.033	Sr	<0.00006	Zr	<0.0007
Cs	<0.05	K	<0.0095	Pr	<0.0046	Ta	<0.004		

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