

Certificate of the Reference Material

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Name of the Material : Elements in River Water  
Material Code : UME EnvCRM 02  
Issue Date : 22.03.2019  
Revision Date : 11.10.2021 (Revision history can be found on the last page)  
Validity Period of the Certificate : 12 months from the sales date  
Certified Values :

Element	Mass Fraction (µg/kg)	
	Certified Value <sup>[1]</sup>	Uncertainty <sup>[3]</sup>
As	15.1	1.7
Cd	0.52	0.06
Ni	14.4	1.1
Pb	13.6	1.0
Se	5.0 <sup>[2]</sup>	0.5

- [1] Calculated from the median of the accepted results submitted by the laboratories using different methods. The certified values and the uncertainties are traceable to the International System of Units (SI).
- [2] Calculated from the arithmetic mean of the dataset obtained by single reference ID-ICP-MS method applied by a single laboratory.
- [3] The expanded uncertainty of certified value includes characterization, homogeneity, stability components and 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 GUM "Guide to the Expression of Uncertainty in Measurement".

TÜBİTAK UME, as a reference material producer, has been accredited by TÜRKAK according to TS EN ISO 17034 with the accreditation number AB-0001-RM.

Sales Date

  
Dr. Mustafa ÇETİNTAŞ  
Director

The following pages are an integral part of the certificate. The use of current certificate is customers' responsibility.

Most recent certificate can be downloaded from [www.ume.tubitak.gov.tr](http://www.ume.tubitak.gov.tr).

### Informative Values

Parameter	Value <sup>[1]</sup>
Density (at 20 °C)	1.015 g/cm <sup>3</sup>
pH (at 20 °C)	0.70

[1] The value is based on four independent replicate measurements of four units from one laboratory.

### Description

The material is filled in a HDPE plastic bottle containing about 100 mL of river water. The content was acidified to have a final concentration of ~2% HNO<sub>3</sub> (v/v). The bottle and its content were sterilized by  $\gamma$ -irradiation at a minimum dose of 25 kGy. Additional information is presented in the certification report.

### Intended Use

This material is intended to be used for method validation of the determination of As, Cd, Ni, Pb and Se mass fractions in river waters and for quality control purposes.

### Instructions for Use

The bottle should be shaken before opening the cap to avoid a bias due to condensed water at the bottleneck. In order to prevent contamination, it is recommended that the bottle should be kept and opened in a clean environment and pipette should not be inserted into the bottle. Minimum sample intake is 0.25 mL for certified elements. After use, the bottle should be immediately and tightly recapped.

### Storage Conditions

This material should be stored at (18 ± 4) °C in a dark and clean environment. This material can be safely dispatched under conditions where the temperature does not exceed 60 °C for up to 4 weeks, i.e. at ambient temperature without applying any cooling elements.

TÜBİTAK UME cannot be held responsible for changes that might happen to the material at customer's premises due to noncompliance with the instructions for use, and the storage conditions given in the certificate.

### Safety Information

The material contains 2% (v/v) nitric acid and elements spiked into solution. Therefore, the usual laboratory safety measures apply as in the case of similar solutions.

It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable.

Please refer to the Safety Datasheet before any use of the material.

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### Participants

Information about the laboratories participated in the characterization study are given in the table below.

Laboratory	Address
BAM	Bundesanstalt für Materialforschung und -prüfung, Berlin, GERMANY
DMDM	Directorate of Measures and Precious Metals, Belgrade, SERBIA
GUM	Central Office of Measures, Warszawa, POLAND
IJS	Jožef Stefan Institute, Ljubljana, SLOVENIA
NTUA	National Technical University of Athens, Athens, GREECE
SYKE	Finnish Environment Institute, Helsinki, FINLAND
TÜBİTAK UME	National Metrology Institute, Gebze - Kocaeli, TURKEY
UW	University of Warsaw, Warsaw, POLAND

### Methods and/or Techniques Used for the Determination of the Certified Values

Techniques used in the characterisation studies:

Method/Technique	Parameter
Anodic Stripping Voltammetry (ASV)	Cd, Pb
Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	As, Cd, Ni, Pb
Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)	As, Cd, Ni, Pb
Isotope Dilution Inductively Coupled Plasma Mass Spectrometry (ID-ICP-MS)	Cd, Ni, Pb, Se

### Revision History

Date	Remarks
22.03.2019	First issue.
11.10.2021	Certificate is updated due to changes in the format of certificate for reference materials.