TÜBİTAK
ULUSAL METROLOJİ ENSTİTÜSÜ

Certificate of the Reference Material

Name of the Material : Elements in Waste Water

Material Code : UME CRM 1204

Issue Date : 15.08.2016

Revision Date : 18.09.2019 (Revision history can be found on the last page)

Validity Period of the Certificate : 1 year from the sales date

Certified Values :

Element	Mass Fraction, µg/kg[4]	Uncertainty, µg/kg[4,5]	Element	Mass Fraction, µg/kg[4]	Uncertainty, µg/kg[4,5]
As[1]	63.2	2.8	Fe[2]	1943	67
B[3]	1388	120	Hg[2]	49.9	2.6
Cd[2]	104.5	4.0	Mn[1]	372	13
Co[1]	419	12	Ni[1]	173	5
Cr[2]	243	8	V[1]	197	6
Cu[2]	334	9	Zn[3]	403	18

[1] Certified value has been assigned based on the results produced by using independent HR-ICP-MS and GF-AAS methods applied by a single laboratory.

[2] Certified value has been assigned by using ID-ICP-MS method.

[3] Certified value has been assigned based on the results produced by using independent HR-ICP-MS ve ID-ICP-MS methods applied by a single laboratory.

[4] The certified values and the uncertainties are traceable to the International System of Units (SI).

[5] 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

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Informative Values

Element	Mass Fraction, µg/kg[4]	Uncertainty, µg/kg[4]
Al[1]	349	14
Mo[2]	95	4
P[2]	698	34
Pb[3]	81	15
Sb[1]	132	6
Tl[2]	157	7

[1] Value has been assigned by using HR-ICP-MS and GF-AAS methods via three independent measurements from three units.
[2] Value has been assigned by using HR-ICP-MS method via three independent measurements from three units.
[3] Value has been assigned by using ID- ICP-MS and HR-ICP-MS methods via three independent measurements from three units.
[4] The expanded uncertainty of the informative value has contribution from characterisation, homogeneity, stability 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".

Parameter	Value[1]
Density (20 °C)	1.0006 g/cm^3
pH (20 °C)	1.8

[1] Values have been calculated based on the results of three independent measurements from three units applied by a single laboratory.

Description

The material is in HDPE bottle containing about 100 mL waste water acidified with HNO_3. Additional information about the material and certification is presented in the certification report.

Intended Use

This material is intended to be used for method validation of the determination of element mass fractions in waste water and quality control purposes.

Instructions for Use

The bottle must be shaken for a minute before opening for assurance of homogeneity. All precautions must be taken in order to prevent contamination and evaporation.

Minimum sample intake is 0.5 mL for Al, As, Cu, Hg, Ni, P, Pb, Sb and Zn, and is 0.1 mL for B, Cd, Co, Cr, Fe, Mn, Mo, Tl and V. The material can be safely dispatched at ambient temperature where the temperature does not exceed 60 °C and the transportation period of 4 weeks.

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Storage Conditions

The material should be stored at (4 ± 2) °C in dark conditions.

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

Safety Information

Usual laboratory precautions apply. It is strongly recommended that the material must be handled and disposed according to the safety guidelines where applicable. Please refer to the Safety Data Sheet before any use of the material.

Participants

Information about the laboratory participated in the characterisation study is given in the following table.

Laboratory	Address
TÜBİTAK UME	TÜBİTAK Gebze Yerleşkesi, Barış Mahallesi, Dr. Zeki Acar Caddesi No.1, 41470 Gebze - Kocaeli / Turkey

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

Methods and/or techniques used in the characterisation studies are given in the following table.

Method/Technique	Elements
Graphite Furnace Atomic Absorption Spectrometry (GF-AAS)	As, Co, Mn, Ni, V
High Resolution Inductively Coupled Plasma Mass Spectrometry (HR-ICP-MS)	As, B, Co, Mn, Ni, V, Zn
Isotope Dilution Inductively Coupled Plasma Mass Spectrometry (ID-ICP-MS)	B, Cd, Cr, Cu, Fe, Hg, Zn

Revision History

Date	Remarks
15.08.2016	First issue.
13.09.2018	Certificate is updated due to format change of the document.
18.09.2019	Information about shipping conditions is added. Certificate is updated due to changes in the format of certificate for reference materials.