

JOINT RESEARCH CENTRE
Directorate F – Health, Consumers and Reference Materials

CERTIFICATE OF ANALYSIS

ERM[®] - CC144

Sewage sludge			
Total content	Mass fraction based on dry mass		
	Certified value ¹⁾	Uncertainty ²⁾	Unit
As	7.7	0.7	mg/kg
Cd	14.5	1.4	mg/kg
Co	6.5	0.4	mg/kg
Cr	168	14	mg/kg
Cu	348	18	mg/kg
Fe	32.9	1.6	g/kg
Hg	5.9	0.6	mg/kg
Mn	352	14	mg/kg
Ni	91	7	mg/kg
Pb	157	9	mg/kg
Zn	0.98	0.04	g/kg
Aqua regia extractable content ³⁾	Mass fraction based on dry mass		
	Certified value ¹⁾	Uncertainty ²⁾	Unit
As	7.7	0.7	mg/kg
Cd	13.3	0.9	mg/kg
Co	5.9	0.4	mg/kg
Cr	150	11	mg/kg
Cu	346	15	mg/kg
Fe	32.8	1.5	g/kg
Hg	6.1	0.7	mg/kg
Mn	340	13	mg/kg
Ni	86	6	mg/kg
Pb	156	7	mg/kg
Zn	0.97	0.04	g/kg

1) Certified values are expressed as unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory and/or with a different method of determination. The certified value and its uncertainty are traceable to the International System of units (SI).
2) The certified uncertainty is the expanded uncertainty with a coverage factor $k = 2$ corresponding to a level of confidence of about 95 % estimated in accordance with ISO/IEC Guide 98-3. Guide to the Expression of Uncertainty in Measurement (GUM: 1995), ISO 2008.
3) Aqua regia extractable content is operationally defined by following ISO 11466:1995 or ISO 12914:2012

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 300 mg for total content of As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn; 30 mg for total content of Hg. The minimum amount of sample to be used for aqua regia extractable content is 500 mg if using ISO 12914:2012 and 3 g if using ISO 11466 for all the certified elements.

Accepted as an ERM[®], Geel, October 2016
Latest revision: January 2017

Signed:



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NOTE

European Reference Material ERM[®]-CC144 was produced and certified under the responsibility of the Joint Research Centre Directorate F – Health, Consumers and Reference Materials in Geel according to the principles laid down in the technical guidelines of the European Reference Materials[®] co-operation agreement between BAM-IRMM-LGC. Information on these guidelines is available on the internet (<http://www.erm-crm.org>).

Additional Material Information		
	Value	Unit
Al ¹⁾	19	g/kg
Ca ¹⁾	31	g/kg
Fe ¹⁾	34	g/kg
K ¹⁾	2.9	g/kg
Mg ¹⁾	3.8	g/kg
Na ¹⁾	1.8	g/kg
P ₂ O ₅ ²⁾	38	g/kg
SiO ₂ ²⁾	73	g/kg
Ti ¹⁾	1.5	g/kg
TOC ³⁾	36	g/100 g
TIC ³⁾	0.1	g/100 g
Water content ⁴⁾	2.5	g/100 g
Water activity ⁴⁾	0.15	1

¹⁾ Measured using k_0 -NAA
²⁾ Analyses performed by gravimetry for SiO₂ and spectrophotometry for P₂O₅
³⁾ Total organic carbon (TOC) and total inorganic carbon (TIC) determined by using a combustion furnace
⁴⁾ Water content determined by volumetric Karl-Fischer titration and water activity by using a water activity meter

DESCRIPTION OF THE MATERIAL

The material consists of minimum 30 g of a homogeneous powder of sewage sludge, provided in an amber glass bottle closed with a polyethylene insert and a screw cap.

ANALYTICAL METHODS USED FOR CERTIFICATION

Atomic fluorescence spectrometry
Direct mercury analyser
Electro-thermal atomic absorption spectrometry
Flame atomic absorption spectrometry
Inductively coupled plasma optical emission spectrometry
Inductively coupled plasma mass spectrometry
 k_0 -Neutron activation analysis

PARTICIPANTS

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(measurements under the scope of ISO/IEC 17025 accreditation; BELAC, 045-TEST)

SAFETY INFORMATION

The usual laboratory safety precautions apply.

INSTRUCTIONS FOR USE AND INTENDED USE

This material is intended for quality control and assessment of method performance. As any reference material, it can also be used for control charts or validation studies.

The bottle should be shaken for at least two minutes before opening to ensure homogeneity of the content. Certified mass fractions are corrected for the water content of the material (dry mass). To determine dry mass, accurately weigh an aliquot of at least 1 g in a ventilated oven at $105\text{ °C} \pm 2\text{ °C}$ for not less than 3 hours and until constant weight is attained. Samples should be cooled down in a desiccator before weighing. Weighing of the samples for dry mass determination and weighing for the analysis shall be done at the same time to avoid differences due to possible take up of moisture by the material.

The minimum amount of sample to be used is 300 mg for total content of As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn and 30 mg for total content of Hg. The minimum amount of sample to be used for aqua regia extractable content is 500 mg if using ISO 12914:2012 and 3 g if using ISO 11466 for all the certified elements.

STORAGE

Sample should be stored at 18 °C ± 5 °C, in the dark. The material picks up moisture when in prolonged contact with humid air. Spoilage by moulds may occur at water contents exceeding 8 % by mass and it may damage the whole sample. Care should be taken to avoid moisture pick up once the bottles are opened.

However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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NOTE

A detailed technical report is available on <https://crm.jrc.ec.europa.eu>. A paper copy can be obtained from the Joint Research Centre Directorate F – Health, Consumers and Reference Materials on request.

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