

# CERTIFICATE OF ANALYSIS

## ERM<sup>®</sup> - CC141

<b>LOAM SOIL</b>		
Total content	Mass fraction based on dry mass	
	Certified value <sup>2)</sup> [mg/kg]	Uncertainty <sup>3)</sup> [mg/kg]
As	9.9	1.5
Cd	0.35	0.05
Co	8.5	0.5
Cr	86	8
Cu	14.4	1.4
Hg	0.083	0.017
Mn	464	18
Ni	26.4	2.4
Pb	41	4
Zn	57	4
Mass fraction based on dry mass		
Aqua regia extractable content <sup>1)</sup>	Certified value <sup>2)</sup> [mg/kg]	Uncertainty <sup>3)</sup> [mg/kg]
As	7.5	1.4
Cd	0.25	0.04
Co	7.9	0.9
Cr	31	4
Cu	12.4	0.9
Hg	0.080	0.008
Mn	387	17
Ni	21.9	1.6
Pb	32.2	1.4
Zn	50	4
<p>1) According to ISO 11466 (two laboratories deviated from the standard method by using microwave digestion)</p> <p>2) 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 values are traceable to the SI.</p> <p>3) The certified uncertainty is the expanded uncertainty with a coverage factor <math>k = 2</math> 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.</p>		

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 100 mg for the total content and 3 g for aqua regia extractable content as prescribed by ISO 11466.

Accepted as an ERM<sup>®</sup>, Geel, August 2010

Latest revision: February 2012

Signed: 

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## NOTE

European Reference Material ERM<sup>®</sup>-CC141 was produced and certified under the responsibility of the Institute for Reference Materials and Measurements of the European Commission's Joint Research Centre according to the principles laid down in the technical guidelines of the European Reference Materials<sup>®</sup> co-operation agreement between BAM-IRMM-LGC. Information on these guidelines is available on the internet website (<http://www.erm-crm.org>).

<b>Additional Material Information</b>	
Major components	Mass Fraction
	Value [g/kg]
SiO <sub>2</sub> <sup>2)</sup>	782.8
MgO <sup>1)</sup>	6.8
Al <sub>2</sub> O <sub>3</sub> <sup>1)</sup>	167.0
TiO <sub>2</sub> <sup>1)</sup>	7.2
Fe <sub>2</sub> O <sub>3</sub> <sup>1)</sup>	65.8
P <sub>2</sub> O <sub>5</sub> <sup>2)</sup>	1.3
K <sub>2</sub> O <sup>1)</sup>	42.2
Na <sub>2</sub> O <sup>1)</sup>	21.7
CaO <sup>1)</sup>	6.2

<sup>1)</sup> Obtained by k<sub>0</sub>-NAA  
<sup>2)</sup> SiO<sub>2</sub> and P<sub>2</sub>O<sub>5</sub> were determined by gravimetry and spectrophotometry, respectively

The total organic carbon is 0.99 % ± 0.03 % (mass fraction) and the total inorganic carbon is < 0.01 % (mass fraction), based on dry mass (measurements performed according to ISO 10694).

The water content as determined by volumetric Karl-Fischer titration is 1.3 % ± 0.2 % (mass fraction).

The water activity, determined using a water activity meter, is 0.201 ± 0.003.

## DESCRIPTION OF THE SAMPLE

The material consists of minimum 24 g of a loam soil, provided in screw-capped amber glass bottles, packaged under argon and closed with polyethylene inserts.

## USE OF THE CERTIFIED REFERENCE MATERIAL

The main purpose of the material is to assess method performance, e.g. for checking accuracy of analytical results. As any reference material, it can also be used for control charts or validation studies.

## ANALYTICAL METHOD USED FOR CERTIFICATION

- Direct mercury analysis
- Cold vapour atomic absorption spectrometry
- Cold vapour atomic fluorescence spectrometry
- Energy dispersive X-ray fluorescence spectrometry
- Electrothermal atomic absorption spectrometry
- Inductively coupled plasma optical emission spectrometry
- Inductively coupled plasma mass spectrometry
- k<sub>0</sub>-neutron activation analysis

## PARTICIPANTS

ALS Laboratory Group, ALS Czech Republic, Praha (CZ) - *Measurements performed under ISO/IEC 17025 accreditation; CAI, 521*

ALS Laboratory Group, ALS Scandinavia AB, Luleå (SE) - *Measurements performed under ISO/IEC 17025 accreditation; SWEDAC-1087*

BAM Federal Institute for Materials Research and Testing - Department of Analytical Chemistry – Reference Materials, Berlin, Germany (measurements under the scope of ISO/IEC 17025, DAP-PL-2614.14)

Centre National de la Recherche Scientifique (CNRS), Service Central d'Analyse, Solaize (FR)

DSM Research BV, Geleen (NL)

Energy Research Centre of the Netherlands (ECN), Petten (NL) - *Measurements performed under ISO/IEC 17025 accreditation; RVA, L135*

European Commission, Joint Research Centre, Institute for Reference Materials and Measurements (IRMM), Geel (BE) - *Measurements performed under ISO/IEC 17025 accreditation; BELAC, 268-TEST*

Helmholtz Zentrum München, Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH), München (DE) - *Measurements performed under ISO/IEC 17025 accreditation; DACH, DAC-PL-0141-01-10*

Institut "Jozef Stefan" (JSI), Department of Environmental Sciences, Ljubljana (SI) - *Measurements performed under ISO/IEC 17025 accreditation; SA, LP-90*

Istituto Superiore per la Protezione e la Ricerca Ambientale, Environmental Metrology Service, Roma (IT) - *Measurements performed under ISO/IEC 17025 accreditation; SIT nr. 211*

LGC Ltd., Teddington (UK) - *Measurements performed under ISO/IEC 17025 accreditation; UKAS, 0003*

Minton Treharne & Daies Ltd (MTD), Herbert J Evans Division, Carmarthenshire (UK) - *Measurements performed under ISO/IEC 17025 accreditation; UKAS, 0024*

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Studiecentrum voor Kernenergie, SCK, Mol (BE) - *Measurements performed under ISO/IEC 17025 accreditation; BELAC, 015-TEST*

The Macaulay Institute, Analytical Service, Aberdeen (UK) - *Measurements performed under ISO/IEC 17025 accreditation; UKAS, 1917*

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Universidad de Barcelona, Facultad de Química, Departamento de Química Analítica, Barcelona (ES)

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Universidad de Santiago, Facultad de Química, Departamento de Química Analítica, Santiago de Compostela (ES)

Vlaamse Instelling voor Technologisch Onderzoek (VITO), Mol (BE) - *Measurements performed under ISO/IEC 17025 accreditation; BELAC, 045-TEST*

## **INSTRUCTIONS FOR USE**

The bottles shall be shaken for at least two minutes before opening to ensure re-homogenisation of the content.

The correction to dry mass shall be determined on a separate portion taken at the same time of the analysis from the same bottle. It shall be carried out by drying at least 1 g of the sub-sample in an oven at +105 °C ± 2 °C until constant weight is achieved.

## **STORAGE**

Samples 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 % (mass percent) and damage the whole sample. Care should be taken to avoid moisture pick up once the bottles are opened.

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.

## **SAFETY INFORMATION**

The usual laboratory safety precautions apply.

## **LEGAL NOTICE**

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## **NOTE**

A detailed technical report is available on [www.erm-crm.org](http://www.erm-crm.org). A paper copy can be obtained from the Joint Research Centre, Institute for Reference Materials and Measurements on request.

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