

Eurofins Umwelt Ost GmbH - Lindenstraße 11 - Gewerbegebiet Freiberg Ost -
D-09627 Bobritzsch-Hilbersdorf

**Biomass to biochar Ltd.
Derrycon upper
Mountshannon
- Clare
IRELAND**

Title : **Analytical Report for Order 12237280**

Test report number : **AR-22-FR-041786-01**

Project name : **Biochar**

Number of samples : **1**

Sample type: **biochar**

Sample Taker: **not specified, sample(s) were delivered to lab**

Sample reception date : **2022-09-27**

Sample processing time : **2022-09-27 - 2022-10-10**

The test results refer solely to the analysed test specimen. Unless the sampling was done by our laboratory or in our sub-order the responsibility for the correctness of the sampling is disclaimed. This analytical report is only valid with signature and may only be further published completely and unchanged. Extracts or changes require the authorisation of the EUROFINs UMWELT in each individual case.

Our General Terms & Conditions of Sale (GTCS) are applicable, as far as no specific agreements do exist. The GTCS are available on <http://www.eurofins.de/umwelt/avb.aspx>.

Accredited test laboratory according to DIN EN ISO/IEC 17025:2018 DAkkS notification under the DAkkS German Accreditation System for Testing. The laboratory is according (D-PL-14081-01-00) accredited.

Attachments

XML_Export_AR-22-FR-041786-01.xml

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Digitally signed 10/12/2022
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Prüfleitung



Parameter	Lab	Accr.	Method	Limit values						Description		Biochar made from Bracken		
				EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Consumer Materials	EBC-Basic Materials	Sample number		ar	db	
										122137803				
											LOQ	Unit		
Biochar properties														
Bulk density < 3 mm	FR		based on VDLUFA-Methode A 13.2.1								kg/m ³	-	90	
specific surface (BET)	SND2/0		DIN ISO 9277: 2014								m ² /g	-	71.2	
water holding capacity (WHC) < 2 mm	FR		DIN EN ISO 14238, A: 2014-03								%	-	392.4	
Moisture	FR	F5	DIN 51718: 2002-06							0.1	% (w/w)	14.8	-	
Ash content (550°C)	FR	F5	DIN 51719: 1997-07							0.1	% (w/w)	9.6	11.2	
Total carbon	FR	F5	DIN 51732: 2014-07							0.2	% (w/w)	65.8	77.2	
carbon (organic)	FR		Calculation								% (w/w)	65.6	77.0	
Hydrogen	FR	F5	DIN 51732: 2014-07							0.1	% (w/w)	2.0	2.4	
Total nitrogen	FR	F5	DIN 51732: 2014-07							0.05	% (w/w)	1.73	2.03	
Sulphur (S), total	FR	F5	DIN 51724-3: 2012-07							0.03	% (w/w)	0.09	0.10	
Oxygen	FR	F5	DIN 51733: 2016-04								% (w/w)	7.3	8.6	
Total inorganic carbon (TIC)	FR	F5	DIN 51726: 2004-06							0.1	% (w/w)	0.2	0.2	
carbonate-CO2	FR	F5	DIN 51726: 2004-06							0.4	% (w/w)	0.6	0.7	
H/C ratio (molar)	FR		Calculation									0.37	0.37	
H/Corg ratio (molar)	FR		Calculation	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7			0.37	0.37	
O/C ratio (molar)	FR		Calculation									0.083	0.084	
pH in CaCl2	FR		DIN ISO 10390: 2005-12									10.0	-	
salt content	FR		BGK III. C2: 2006-09							0.005	g/kg	24.5	-	
salt content	FR		BGK III. C2: 2006-09							0.005	g/l	2.21	-	
Conductivity at 1,2 t pressure	FR		Internal Method SAA-H-Lf-Pflanzenkohle.040							0.01	mS/cm	-	0.02	
Conductivity at 2 t pressure	FR		Internal Method SAA-H-Lf-Pflanzenkohle.040							0.01	mS/cm	-	0.03	

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LOQ	Unit												
Conductivity at 3 t pressure	FR		Internal Method SAA-H-Lf-Pflanzenkohle.040							0.01	mS/cm	-	0.04
Conductivity at 4 t pressure	FR		Internal Method SAA-H-Lf-Pflanzenkohle.040							0.01	mS/cm	-	0.05
Conductivity at 5 t pressure	FR		Internal Method SAA-H-Lf-Pflanzenkohle.040							0.01	mS/cm	-	0.07

Elements from the micro wave pressure digestion acc. to DIN 22022-1: 2014-07

Arsenic (As)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		13	13	13	13		0.8	mg/kg	-	< 0.8
Lead (Pb)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		45	120	120	120		2	mg/kg	-	< 2
Cadmium (Cd)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		0.7	1.5	1.5	1.5		0.2	mg/kg	-	0.2
Copper (Cu)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	70	70	100	100	100		1	mg/kg	-	12
Nickel (Ni)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	25	25	50	50	50		1	mg/kg	-	20
Mercury (Hg)	FR	F5	DIN 22022-4: 2001-02		0.4	1	1	1		0.07	mg/kg	-	< 0.07
Zinc (Zn)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	200	200	400	400	400		1	mg/kg	-	62
Chromium (Cr)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	70	70	90	90	90		1	mg/kg	-	29
Boron (B)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							1	mg/kg	-	25
Manganese (Mn)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							1	mg/kg	-	995
Silver (Ag)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							5	mg/kg	-	< 5

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										122137803			
LOQ	Unit												

Elements fr. the borate digestion of ash 550 °C acc. to DIN 51729-11:1998-11(AR)

Calcium as CaO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	8.1
Iron as Fe2O3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	3.2
Potassium as K2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	34.9
Magnesium as MgO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	4.4
Sodium as Na2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	3.3
Phosphorus as P2O5	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	4.5
sulphur as SO3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	2.2
Silicon as SiO2	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	25.4

Macronutrients

Total nitrogen	FR	F5	DIN 51732: 2014-07							0.5	g/kg	17.3	20.3
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Macronutrients-LiBO2/Li2B4O7/LiBr-melt of ash 550°C [DIN 51729-11:1998-11] (OS)

Phosphorus as P2O5	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	5.1
Potassium as K2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	39.1
Calcium as CaO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	9.1
Magnesium as MgO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	5.0
Sodium as Na2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	3.7
sulphur as SO3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	2.4

Elements fr. the borate digestion of ash 550°C acc. to DIN 51729-11:1998-11(OS)

Iron (Fe)	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	2.5
Silicon (Si)	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	13.3

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										122137803			
Organic contaminants from toluene extraction acc. to EN 16181:2019-08 (method 2)													
LOQ	Unit												
Naphthalene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	1.8
Acenaphthylene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Acenaphthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.1
Fluorene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.4
Phenanthrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	1.0
Anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.3
Fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.4
Pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.4
Benzo(a)anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.1
Chrysene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	0.2
Benzo(b)fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Benzo(k)fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Benzo(a)pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Indeno(1,2,3-cd)pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Dibenz(a,h)anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Benzo(g,h,i)perylene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	< 0.1
Total 8 EFSA-PAH excl. LOQ	FR	F5	DIN EN 16181:2019-08	1	1	1	1	1	4		mg/kg	-	0.3
Total 16 EPA-PAH excl. LOQ	FR	F5	DIN EN 16181:2019-08		4 ¹⁾	6 ¹⁾					mg/kg	-	4.7
Benzo(e)pyrene	FR	F5	DIN EN 16181:2019-08	< 1	< 1	< 1	< 1	< 1	< 1	0.1	mg/kg	-	< 0.1
Benzo-(j)-fluoranthene	FR	F5	DIN EN 16181:2019-08	< 1	< 1	< 1	< 1	< 1	< 1	0.1	mg/kg	-	< 0.1

Explanations

LOQ - Limit of quantification

ar - as received

db - dry basis

Lab - Abbreviation of the performing laboratory

Accr. - Abbreviation of the accreditation of the performing laboratory

The parameters identified by FR have been performed by the laboratory Eurofins Umwelt Ost GmbH (Lindenstraße 11, Gewerbegebiet Freiberg Ost, Bobritzsch-Hilbersdorf). The accreditation code F5 identifies the parameters accredited according to DIN EN ISO/IEC 17025:2018 DAkkS D-PL-14081-01-00 .

The parameters identified by SND2 have been performed by the laboratory Ruhr Lab GmbH (Glückaufstraße 56, Gelsenkirchen).

/o - The analysis has been outsourced.

Explanations regarding Limits

Analysis performed according to guidelines for the sustainable production of biochar - EBC, Version 10.1E - of 10/01/2022.

Ho,V / Hu,p: complies calorific value at constant volume or pressure

AR: related to ash

OS: related to original substance

¹⁾ The very low PAH limit values only allow an analytical accuracy of 50% for the limit value: "sum 16 EPA-PAH" of 4 mg/kg and of 40% for the limit value of 6 mg/kg which implies an accuracy of ± 2 mg/kg db and ± 2.4 mg/kg db, respectively.

The presentation of comparative values in the analytical report is a service provided by EUROFINS UMWELT. The cited comparative values (limit, guideline or other allocation values) are partially simplified and do not take into account all comments, ancillary provisions and/or exemptions of the corresponding regulations.