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Gewerbegebiet Freiberg Ost - D-09627 - Bobritzsch-Hilbersdorf

**Bussme Energy AB**  
**Bäckgatan 4**  
**233 31 Svedala**  
**SWEDEN**

Title : **Test report for order 12031492**

Test report number : **AR-20-FR-032788-01**

Project name : **analysis of biochar**

Number of samples : **1**

Sample type: **biochar**

Sample Taker: **Client**

Sample reception date : **2020-09-03**

Sample processing time : **2020-09-03 - 2020-10-02**

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 test 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 17025:2005 notification under the DAkkS German Accreditation System for Testing. The laboratory is according (D-PL-14081-01-00) accredited.

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Digitally signed 10/2/2020  
Annett Rietschel  
Prüfleitung



Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	
<b>Biochar properties</b>												
Bulk density < 3 mm	FR		in Anlehnung an VDLUFA-Methode A 13.2.1						kg/m <sup>3</sup>	-	-	281
specific surface (BET)	SND2/ o		DIN ISO 9277						m <sup>2</sup> /g	-	-	345.15
water holding capacity (WHC)	FR		DIN EN ISO 14238, A: 2014-03						%	-	-	206.8
Moisture	FR	JE02	DIN 51718: 2002-06					0.1	% (w/w)	-	67.6	-
Ash content (550°C)	FR	JE02	DIN 51719: 1997-07					0.1	% (w/w)	-	3.6	11.1
Ash content (815°C)	FR	JE02	DIN 51719: 1997-07					0.1	% (w/w)	-	2.8	8.6
Carbon	FR	JE02	DIN 51732: 2014-07					0.2	% (w/w)	-	27.4	84.6
carbon (organic)	FR	JE02	berechnet						% (w/w)	-	26.6	82.1
Hydrogen	FR	JE02	DIN 51732: 2014-07					0.1	% (w/w)	-	0.4	1.2
Total nitrogen	FR	JE02	DIN 51732: 2014-07					0.05	% (w/w)	-	0.27	0.83
Sulphur (S), total	FR	JE02	DIN 51724-3: 2012-07					0.03	% (w/w)	-	< 0.03	0.04
Oxygen	FR	JE02	DIN 51733: 2016-04						% (w/w)	-	1.5	4.7
Total inorganic carbon (TIC)	FR	JE02	DIN 51726: 2004-06					0.1	% (w/w)	-	0.8	2.5
carbonate-CO2	FR	JE02	DIN 51726: 2004-06					0.4	% (w/w)	-	3.0	9.2
H/C ratio (molar)	FR	JE02	berechnet							-	0.17	0.17
H/Corg ratio (molar)	FR	JE02	berechnet	< 0.7	< 0.7	< 0.7	< 0.7			-	0.17	0.17
O/C ratio (molar)	FR	JE02	berechnet	< 0.4	< 0.4	< 0.4	< 0.4			-	0.041	0.042
pH in CaCl2	FR		DIN ISO 10390: 2005-12							-	9.6	-
Conductivity	FR		BGK III. C2: 2006-09					5	µS/cm	-	613	-
salt content	FR		BGK III. C2: 2006-09					0.005	g/kg	-	3.24	-
salt content	FR		BGK III. C2: 2006-09					0.005	g/l	-	0.910	-
Protein, crude	FR	JE02	VDLUFA Methodenbuch Band III: 2014-09						% (w/w) dm	not determined	-	-
Fat, crude	FR	JE02	VDLUFA Methodenbuch Band III: 2014-09						% (w/w) dm	not determined	-	-

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC-Feed class I	EBC-AgroBio class II	EBC-Agro class III	EBC-material class IV	Sample number		120119566		
				LOQ	Unit		ar	db				
Crude fibre	FR	JE02	VDLUFA Methodenbuch Band III: 2014-09						% (w/w) dm	not determined	-	-
HCl-insoluble ash	SA06/o		VDLUFA III 8.2						Ma.-% Raw Product	0.67	-	-
Fluor total (F)	SA06/o	RE000 CR	VDLUFA III, 17.3.2: 2006	150					mg/kg 88% DM	< 10	-	-

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	
<b>Polychlorinated dibenzodioxins/-furans (17 PCDD/F) by GC-HRMS</b>												
2,3,7,8-TetraCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
1,2,3,7,8-PentaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.15	-	-
1,2,3,4,7,8-HexaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.15	-	-
1,2,3,6,7,8-HexaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.15	-	-
1,2,3,7,8,9-HexaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.15	-	-
1,2,3,4,6,7,8-HeptaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.57	-	-
OctaCDD	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	2.1	-	-
2,3,7,8-TetraCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.059	-	-
1,2,3,7,8-PentaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.17	-	-
2,3,4,7,8-PentaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
1,2,3,4,7,8-HexaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.2	-	-
1,2,3,6,7,8-HexaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
1,2,3,7,8,9-HexaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
2,3,4,6,7,8-HexaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
1,2,3,4,6,7,8-HeptaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.21	-	-
1,2,3,4,7,8,9-HeptaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.1	-	-
OctaCDF	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	< 0.2	-	-
WHO(2005)-PCDD/F TEQ (lower-bound)	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.0394	-	-
WHO(2005)-PCDD/F TEQ (upper-bound)	SA06/o		DIN 38414-S24: 2000-10						ng/kg dw	0.395	-	-
WHO(2005)-PCDD/F TEQ (upper-bound)	SA06/o		berechnet	0.75					ng/kg 88% DM	0.348	-	-

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	
<b>Polychlorinated biphenyl (12 WHO PCB) by GC-HRMS</b>												
PCB 77	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	5	-	-
PCB 81	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 0.2	-	-
PCB 105	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	7	-	-
PCB 118	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	25	-	-
PCB 114	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 3	-	-
PCB 123	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 2	-	-
PCB 126	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 0.3	-	-
PCB 156	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	7.9	-	-
PCB 157	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	2	-	-
PCB 167	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 2	-	-
PCB 169	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 0.3	-	-
PCB 189	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	< 3	-	-
WHO(2005)-PCB TEQ (lower-bound)	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	0.00176	-	-
WHO(2005)-PCB TEQ (upper-bound)	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	0.0411	-	-
WHO(2005)-PCB TEQ (upper-bound)	SA06/o		berechnet						ng/kg 88% DM	0.0362	-	-
WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	SA06/o		DIN 38407-F3: 1998-07						ng/kg dw	0.437	-	-
WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	SA06/o		berechnet	1.25					ng/kg 88% DM	0.384	-	-

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	

**Polychlorinated biphenyl (7 PCB) by GC-HRMS**

Total 6 Indicator PCB (incl. LOQ)	SA06/o		DIN 38414-S20: 1996-01	10					µg/kg 88% DM	0.57	-	-
PCB 28	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.12	-	-
PCB 52	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.11	-	-
PCB 101	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.097	-	-
PCB 153	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.097	-	-
PCB 138	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.088	-	-
PCB 180	SA06/o		DIN 38414-S20: 1996-01						µg/kg 88% DM	0.053	-	-

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

Copper (Cu)	FR	JE02	DIN EN ISO 17294-2: 2005-02	100	70	100	250	1	mg/kg	-	-	63
Nickel (Ni)	FR	JE02	DIN EN ISO 17294-2: 2005-02	30	25	50	250	1	mg/kg	-	-	4
Zinc (Zn)	FR	JE02	DIN EN ISO 17294-2: 2005-02	400	200	400	750	1	mg/kg	-	-	68
Chromium (Cr)	FR	JE02	DIN EN ISO 17294-2: 2005-02	80	70	90	250	1	mg/kg	-	-	17
Boron (B)	FR	JE02	DIN EN ISO 17294-2: 2005-02					1	mg/kg	-	-	41
Manganese (Mn)	FR	JE02	DIN EN ISO 17294-2: 2005-02					1	mg/kg	-	-	829

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	

**Elements from the pressure digestion acc. to DIN EN 13805: 2014-12**

Arsenic (As)	SA06/o	RE000 CR	DIN EN ISO 17294-2: 2005-02	2					mg/kg 88% DM	3.2	-	-
Lead (Pb)	SA06/o	RE000 CR	DIN EN ISO 17294-2: 2005-02	10					mg/kg 88% DM	5.9	-	-
Cadmium (Cd)	SA06/o	RE000 CR	DIN EN ISO 17294-2: 2005-02	1					mg/kg 88% DM	0.017	-	-
Mercury (Hg)	SA06/o	RE000 CR	DIN EN 15763:2010-04	0.1					mg/kg 88% DM	0.024	-	-

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

Calcium as CaO	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	32.4
Iron as Fe2O3	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	0.9
Potassium as K2O	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	10.6
Magnesium as MgO	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	4.2
Sodium as Na2O	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	1.1
Phosphorus as P2O5	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	4.9
sulphur as SO3	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	0.7
Silicon as SiO2	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	13.9

Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC- Feed class I	EBC- AgroBio class II	EBC- Agro class III	EBC-ma- terial class IV	Sample number		120119566		
								LOQ	Unit	ar	db	
<b>Elements fr. the borate digestion of ash 550°C acc. to DIN 51729-11:1998-11(OS)</b>												
Calcium (Ca)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	2.6
Iron (Fe)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	< 0.1
Potassium (K)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	1.0
Magnesium (Mg)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	0.3
Sodium (Na)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	< 0.1
Phosphorus	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	0.2
Sulphur (S)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	< 0.1
Silicon (Si)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	-	0.7
<b>Organic contaminants from toluene extraction acc. to EN 16181:2019-08 (method 2)</b>												
Naphthalene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	260	-	-
Acenaphthylene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	11	-	-
Acenaphthene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	< 10	-	-
Fluorene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	17	-	-
Phenanthrene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	160	-	-
Anthracene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	< 10	-	-
Fluoranthene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	18	-	-
Pyrene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	56	-	-



Parameter	Lab	Accr.	Method	Limit values				Description		sp-se-25-1-1-1		
				EBC-Feed class I	EBC-AgroBio class II	EBC-Agro class III	EBC-material class IV	Sample number		120119566		
				LOQ	Unit	ar	db					
Benz(a)anthracene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	< 10	-	-
Chrysene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	12	-	-
Benzo(b)fluoranthene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	14	-	-
Benzo(k)fluoranthene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	< 10	-	-
Benzo(a)pyrene	SA06/o		DIN ISO 13877: 2000	25				10	µg/kg 88% DM	< 10	-	-
Indeno(1,2,3-cd)pyrene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	31	-	-
Dibenz(a,h)anthracene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	< 10	-	-
Benzo(g,h,i)perylene	SA06/o		DIN ISO 13877: 2000					10	µg/kg 88% DM	47	-	-
Total 16 EPA-PAH excl. LOQ	SA06/o		DIN ISO 13877: 2000						µg/kg 88% DM	630	-	-
Total 16 EPA-PAH excl. LOQ	SA06/o		berechnet	4	4	6	30		mg/kg dw	0.72	-	-

## 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

not determined:

These methods apply for animal feed conventional type. The methods are not validated for the matrix biochar and can lead to implausible results.

" Crude protein, crude fiber and crude fat are completely decomposed in the course of complete pyrolysis and are therefore no longer present in biochar. A biochar is considered to be completely pyrolyzed if the H / Corg ratio is <0.7.

If the H / Corg ratio according to EBC-AgroOrganic is less than 0.7, the analysis of crude protein, crude fiber and crude fat is not required and set by definition as 0 g kg<sup>-1</sup>. The information is mandatory and must be stated on the product label." [1]

[1] - EBC (2012) 'European Biochar Certificate - Guidelines for a Sustainable Production of Biochar.' European Biochar Foundation (EBC), Arbaz, Switzerland. <http://www.europeanbiochar.org/en/download>. Version 9.1E of 25st September 2020

The parameters identified by FR have been performed by the laboratory Eurofins Umwelt Ost GmbH (Bobritzsch-Hilbersdorf). The accreditation code JE02 identifies the parameters accredited according to DIN EN ISO/IEC 17025:2005 D-PL-14081-01-00 .

The parameters identified by SA06 have been performed by the laboratory SYNLAB Analytics & Services Germany GmbH (Jena). The accreditation code RE000CR identifies the parameters accredited according to DIN EN ISO/IEC 17025:2018 DAkkS D-PL-14004-10-00 .

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

/o - The analysis has been outsourced.

## Explanations regarding Limits

Analysis performed according to guidelines for the sustainable production of biochar - EBC, Version 9.0G - as of 06/01/2020.

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

AR: related to ash

OS: related to original substance

EUROFINS UMWELT assumes no responsibility for the legal liability of the cited limits.