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This report replaces the previous report AR-19-FR-023114-01 from 2019-09-04 because of Modification of the Analytical Scope.

Title : **Test report for order 11920494**

Test report number : **AR-19-FR-023114-02**

Project name : **Biochar**

Number of samples : **5**

Sample type : **biochar**

Sample Taker: **Client**

Sample reception date : **2019-07-15**

Sample processing time : **2019-07-15 - 2019-11-21**

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.

Attachments

119083859-1

119083859-2

119083861-1

119083861-2

119083862-1

119083862-2

119083863-1

119083863-2



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Prüfleitung

Parameter	Lab	Accr.	Method	Limit values				Description		Retort		Traditional Kiln		Kontiki Kiln	
				GW 1 ar	GW 1 db	GW 2 ar	GW 2 db	Sample number		119083859		119083860		119083861	
				LOQ	Unit	ar	db	ar	db	ar	db	ar	db		
Biochar properties															
Bulk density	FR	JE02	DIN 51705: 2001-06					kg/m ³	417	-	-	-	-	355	-
specific surface (BET)	SUIB/o		DIN 66137/DIN ISO 9277					m ² /g	-	98*	-	-	-	-	1,3*
true density	SUIB/o		DIN 66137/DIN ISO 9277					g/cm ³	-	1.5	-	-	-	-	1.5
Moisture	FR	JE02	DIN 51718: 2002-06					% (w/w)	0.1	5.5	-	8.7	-	4.9	-
Ash content (550°C)	FR	JE02	DIN 51719: 1997-07					% (w/w)	0.1	11.8	12.5	-	-	7.3	7.7
Hydrogen	FR	JE02	DIN 51732: 2014-07					% (w/w)	0.1	2.4	2.6	-	-	2.4	2.5
Carbon	FR	JE02	DIN 51732: 2014-07		> 50		> 50	% (w/w)	0.2	73.2	77.5	-	-	77.7	81.8
Total nitrogen	FR	JE02	DIN 51732: 2014-07					% (w/w)	0.05	0.83	0.88	-	-	0.84	0.88
Oxygen	FR	JE02	DIN 51733: 2016-04					% (w/w)		10.6	11.3	-	-	9.3	9.8
Total inorganic carbon (TIC)	FR	JE02	DIN 51726: 2004-06					% (w/w)	0.1	1.1	1.2	-	-	0.6	0.6
carbonate-CO2	FR	JE02	DIN 51726: 2004-06					% (w/w)	0.4	4.1	4.3	-	-	2.0	2.1
carbon (organic)	FR	JE02	berechnet					% (w/w)		72.1	76.3	-	-	77.1	81.2
H/C ratio (molar)	FR	JE02	berechnet		< 0.6		< 0.6			0.39	0.39	-	-	0.37	0.37
H/Corg ratio (molar)	FR	JE02	berechnet		< 0.7		< 0.7			0.40	0.40	-	-	0.37	0.37
O/C ratio (molar)	FR	JE02	berechnet		< 0.4		< 0.4			0.109	0.109	-	-	0.090	0.090
Sulphur (S), total	FR	JE02	DIN 51724-3: 2012-07					% (w/w)	0.03	0.05	0.06	-	-	0.04	0.05
pH in CaCl2	FR		DIN ISO 10390: 2005-12	10			10			7.6	-	-	-	8.4	-
Conductivity	FR		BGK III. C2: 2006-09					µS/cm	5	557	-	-	-	473	-
salt content	FR		BGK III. C2: 2006-09					g/kg	0.005	2.95	3.12	-	-	2.55	2.68
salt content	FR		BGK III. C2: 2006-09					g/l	0.005	1.23	1.30	-	-	0.905	0.952
thermogravimetry TGA 950°C by N-Atm.	FR		TGA 701 D4C							see attachment	-	-	-	see attachment	-

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				GW 1 ar	GW 1 db	GW 2 ar	GW 2 db	Sample number		119083859		119083860		119083861	
				LOQ	Unit	ar	db	ar	db	ar	db	ar	db		
Elements from the micro wave pressure digestion acc. to DIN 22022-1: 2014-07															
Arsenic (As)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 13		< 13	0.8	mg/kg	-	< 0.8	-	-	-	< 0.8
Lead (Pb)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 150		< 120	2	mg/kg	-	< 2	-	-	-	< 2
Cadmium (Cd)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 1.5		< 1	0.2	mg/kg	-	< 0.2	-	-	-	< 0.2
Copper (Cu)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 100		< 100	1	mg/kg	-	3	-	-	-	6
Nickel (Ni)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 50		< 30	1	mg/kg	-	< 1	-	-	-	1
Mercury (Hg)	FR	JE02	DIN 22022-4: 2001-02		< 1		< 1	0.07	mg/kg	-	< 0.07	-	-	-	< 0.07
Zinc (Zn)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 400		< 400	1	mg/kg	-	9	-	-	-	15
Chromium (Cr)	FR	JE02	DIN EN ISO 17294-2: 2005-02		< 90		< 80	1	mg/kg	-	< 1	-	-	-	< 1
Boron (B)	FR	JE02	DIN EN ISO 17294-2: 2005-02					1	mg/kg	-	13	-	-	-	9
Manganese (Mn)	FR	JE02	DIN EN ISO 17294-2: 2005-02					1	mg/kg	-	19	-	-	-	9
Elements fr. the borate digestion of ash 550 °C acc. to DIN 51729-11: 1998-11															
Phosphorus as P ₂ O ₅	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	0.6	-	-	-	3.0
Magnesium as MgO	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	3.0	-	-	-	5.1
Calcium as Calciumoxid	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	43.0	-	-	-	37.0
Potassium as K ₂ O	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	5.2	-	-	-	11.9
Sodium as Na ₂ O	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	0.5	-	-	-	0.4
Iron as Fe ₂ O ₃	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	0.4	-	-	-	0.2
Silicon as SiO ₂	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	3.1	-	-	-	1.7
sulphur as SO ₃	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					0.1	% (w/w)	-	1.1	-	-	-	2.3

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				LOQ	Unit	ar	db	ar	db	ar	db	ar	db		
Elements fr. the borate digestion of ash 550°C acc. to DIN 51729-11:1998-11 (OS)															
Calcium (Ca)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	3.8	-	-	-	-	2.0
Iron (Fe)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.0	-	-	-	-	0.0
Potassium (K)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.5	-	-	-	-	0.8
Magnesium (Mg)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.2	-	-	-	-	0.2
Sodium (Na)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.0	-	-	-	-	0.0
Phosphorus	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.0	-	-	-	-	0.1
Sulphur (S)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.1	-	-	-	-	0.1
Silicon (Si)	FR	JE02	DIN EN ISO 11885 (E22): 2009-09					% (w/w)	-	0.2	-	-	-	-	0.1

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				LOQ	Unit	ar	db	ar	db	ar	db	ar	db		
Elements from toluene extraction															
Naphthalene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	3.2	-	5.8	-	2.5
Acenaphthylene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	< 0.1	-	< 0.1
Acenaphthene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	0.1	-	< 0.1
Fluorene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.2	-	0.6	-	< 0.1
Phenanthrene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.8	-	2.4	-	0.6
Anthracene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.2	-	0.5	-	0.2
Fluoranthene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.2	-	0.5	-	0.3
Pyrene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.2	-	0.7	-	0.4
Benz(a)anthracene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	0.1	-	0.3	-	< 0.1
Chrysene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	0.3	-	< 0.1
Benzo(b)fluoranthene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	< 0.1	-	< 0.1
Benzo(k)fluoranthene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	< 0.1	-	< 0.1
Benzo(a)pyrene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	0.1	-	< 0.1
Indeno(1,2,3-cd)pyrene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	0.1	-	< 0.1
Dibenz(a,h)anthracene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	< 0.1	-	< 0.1
Benzo(g,h,i)perylene	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)					0.1	mg/kg	-	< 0.1	-	< 0.1	-	< 0.1
Total 16 EPA-PAH excl. LOQ	FR	JE02	DIN EN 16181:2017-11 (Norm-Entwurf)		< 12		< 4		mg/kg	-	4.9	-	11.4	-	4.0