UK Biochar Research Centre

reducing and removing CO_2 while improving soils: a significant and sustainable response to climate change

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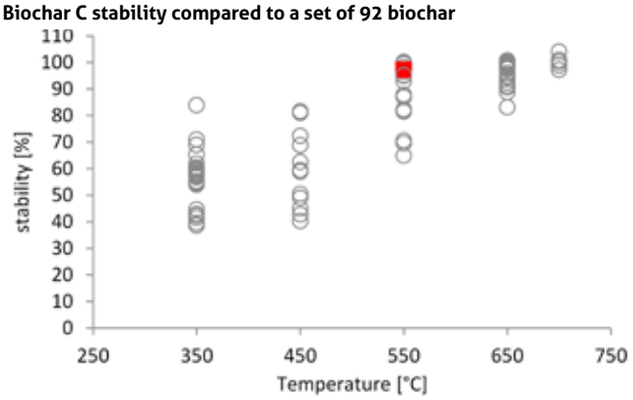
OSR550

Standard biochar specification sheet – Version 1.0 | November 2014

Feedstock: Oil Seed Rape Straw Pellets | **Production:** Pilot-scale rotary kiln pyrolysis unit, nominal peak temp. 550°C

Key features: • Reproducible • Extensively characterised • Readily available

Biochar C stability compared to a set of 92 biochar



Basic Utility Properties		Mean	Run-to-Run Variation, SD(n)
Moisture[a]	wt% (a.r.)	2.61	0.49 (8)
C_{tot}	wt% (d.b.)	68.85	2.26 (4)
H	wt% (d.b.)	1.82	0.22 (4)
O (by difference)	wt% (d.b.)	8.91	1.30 (4)
$H:C_{tot}$	Molar ratio	0.32	0.03 (4)
$O:C_{tot}$	Molar ratio	0.10	0.02 (4)
C_{org}	wt% (d.b.)	tbd	tbd
$H:C_{org}$	Molar ratio	tbd	tbd
Total ash[a]	wt% (d.b.)	19.50	2.16 (8)
Total N	wt% (d.b.)	1.59	0.22 (4)
pH	[-]	9.78	0.47 (4)
Electric conductivity	dS/m	2.27	0.38 (4)
Liming (if pH above 7)	% $CaCO_3$	tbd	tbd
Biochar C stability[b]	% C-basis	97.31	0.25 (5)

Production parameters		Mean	Run-to-Run Variation, SD(n)
Nominal HTT	°C	550	- (1)
Reactor wall temp.	°C	550	- (1)
Max. char HTT	°C	553	- (1)
Heating rate	°C/min	78	- (1)
Kiln residence time	min	12	- (1)
Mean time at HTT	min	5	- (1)
Biochar yield	wt% (d.b.)	28.87	0.78 (2)
Pyrolysis liquid yield	wt% (d.b.)	tbd	tbd
Pyrolysis gas yield	wt% (d.b.)	tbd	tbd
Pyrolysis liquid HHV	MJ/kg	1.35	- (1)
Pyrolysis gas HHV	MJ/kg	9.52	- (1)

Advanced Analysis & Soil Enhancement Properties		Mean	Run-to-Run Variation, SD(n)
Mineral N (ammonium & nitrate)	mg/kg (d.b.)	<3	- (2)
Total P[c]	wt% (d.b.)	0.29	0.08 (4)
Total K[c]	wt% (d.b.)	2.86	0.26 (4)
Available P	mg/kg (d.b.)	tbd	tbd
Volatile Matter[a]	wt% (d.b.)	16.38	2.78 (8)
Total Surface Area	m^2/g (d.b.)	7.3	- (1)
External Surface Area	m^2/g (d.b.)	tbd	tbd

Toxicant Reporting - Total Content			Mean	Run-to-Run Variation, SD(n)	comparison vs. recommended standard thresholds+ IBI	EBC (premium)	BQM (high grade)
Germination Inhibition Assay		pass/fail	tbd	tbd			
Polycyclic Aromatic Hydrocarbons (EPA16)[d]		mg/kg dry wt	0.54	0.16 (2)	6-20	4	20
Dioxin/ Furan (PCDD/ Fs)[e]		ng/kg dry wt	6.8	- (1)	9	20	20
Polychlorinated Biphenyls (PCBs)[f]		ng/kg dry wt	0.001	- (1)	0.2-0.5	0.2	0.50
As	modified dry ashing followed by ICP-OES	mg/kg dry wt	1.09	0.78 (3)	12-100	n/a	10
Cd		mg/kg dry wt	1.76	1.57 (3)	1.4-39	1	3
Cr		mg/kg dry wt	bdl	- (3)	64-1200	80	15
Co		mg/kg dry wt	3.06	0.28 (3)	40-150	n/a	n/a
Cu		mg/kg dry wt	7.86	2.38 (3)	63-1500	100	40
Pb		mg/kg dry wt	17.62	15.99 (3)	70-500	120	60
Hg		mg/kg dry wt	bdl	- (3)	1-17	1	1
Mo		mg/kg dry wt	1.29	0.34 (3)	5-20	n/a	10
Ni		mg/kg dry wt	2.49	0.74 (3)	47-600	30	10
Se		mg/kg dry wt	bdl	- (3)	1-36	n/a	5
Zn		mg/kg dry wt	7.22	2.93 (3)	200-7000	400	150

Notes: HTT=highest treatment temperature, HHV = higher heating value, tbd = to be defined in next version, bdl. = below detection limit, SD = standard deviation (refers to run-to-run consistency, not analytical error) + available standards related to biochar (IBI = International Biochar Initiative, EBC = European Biochar Standard, BQM = Biochar Quality Mandate), [e] as TEQ (toxic equivalent) values were bdl, total (tetra to octa chlorinated) dioxin/furan content is reported instead.

(a) TGA, (b) Cross A, Sohi SP (2013), (c) Aqua Regia digestion followed by ICP, (d) Soxhlet extraction (toluene, 6h) determination by GCMS, (e) US EPA 1613, (f) AES 084 (based on US EPA 1668)

For full details please go to: http://www.charchive.org/record.php?record_id=98