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TEST REPORT

DATE OF REPORT	:	27 June 2016
DESCRIPTION OF SAMPLES	:	Biochar
REPORT NO.	:	F4662 issue 5
QUOTATION NO.	:	COM 450/2016
CUSTOMER ORDER NO.	:	Prepaid
CONTACT PERSON	:	Martin van der Merwe
CONTACT DETAILS	:	012 665 9431
CUSTOMER	:	Lanstar
CUSTOMER CONTACT PERSON	:	John Hofmeyr
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CUSTOMER TELEPHONE NO	:	011-7887040
CUSTOMER MAIL	:	lanstar@global.co.za
DESCRIPTION OF TESTS REQUIRED	:	Evaluation of Biochar
CONDITION OF SAMPLES	:	In plastic bags
DATE SAMPLES RECEIVED	:	17 March 2016

TEST CONDITION SUMMARY

Item	Evaluation
Carbon dioxide adsorption	The sample was degassed at 250°C under vacuum. Carbon dioxide was adsorbed under ice water (0 ºC) at different pressures and the active surface area was calculated using the BET formula.
Pore structure	The sample was degassed at 250 °C under vacuum. The pore structure was analysed by nitrogen adsorption. Micropores: calculated from the t-plot, up to 20 Å Mesopores: calculated from BJH adsorption, 20 - 500 Å Total pores: Total to 3000 Å
Proximate analysis:	Results were calculated to as-received sample
Moisture content	The sample was heated overnight at 175ºC and mass loss determined.
Mass loss at 450ºC	The sample was exposed to 450ºC under a flow of nitrogen for 6 hours. Result was reported after subtracting the moisture content.
Ash content	The sample was combusted overnight at 550ºC.
Fixed carbon	Calculated as 100 – (moisture + volatiles + ash)

TEST RESULTS:

Test	Units	CCC1	VTK1	TJG1	VTP1
CO_2 Active surface area	m^2/g	391	279	246	248
N_2 Active surface area	m^2/g	1008	48	206	113
Micropore volume (N_2)	(cm^3/g)	0.371	0.018	0.087	< 0.001
Mesopore volume (N_2)	(cm^3/g)	0.263	0.006	0.001	0.001
Total pore volume (N_2)	(cm^3/g)	0.671	0.035	0.091	0.006
Moisture content at 175ºC	%	5.5	8.1	12.8	7.9
Mass loss at 450ºC	%	<1	3.8	6.4	3.6
Ash content 550ºC	%	12.6	3.3	4.4	5.1
Fixed carbon (proximate)	%	80.9	84.8	76.4	83.4

Conclusions:

Although many surface related results appear odd, it can be derived that the Biochar with the best pore structure is the TJG1.

VTP1 indicates a poor pore structure which does not match with the fairly good surface area. The pore size seems to be bigger than 300 Å, no micropores and little mesopores.

The odd results can possibly be caused by specific surface chemistry, functional groups, polarity and/or acid/base properties.

WORK PERFORMED BY: _____ 27 June 2016

M C Mathebe
(Scientist)

WORK APPROVED BY: _____ 27 June 2016

M M van der Merwe
(Chief Scientist)

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