

Electronic Supplementary Information (ESI) for New Journal of Chemistry

Mass preparation of micro/nano-powders of biochar with water-dispersibility and their potential application

Linjian Li,^{a,1} Kun Zhang,^{b,1} Li Chen,^a Zhong Huang,^a Guangbin Liu^{a,*} Mingfang Li,^a and Yangping Wen^{a,*}

^a Key Laboratory of Applied Chemistry, Jiangxi Agricultural University, Nanchang 330045, P.

R. China

^b Jiangxi Institute of Red Soil, Nanchang, 330046, P. R. China

*Corresponding author: E-mail: wenyangping1980@gmail.com, E-mail: lgb267@126.com

Fax: +86-791-83813538, Tel.: +86-791-83828158.

¹ These authors contributed equally to this work.

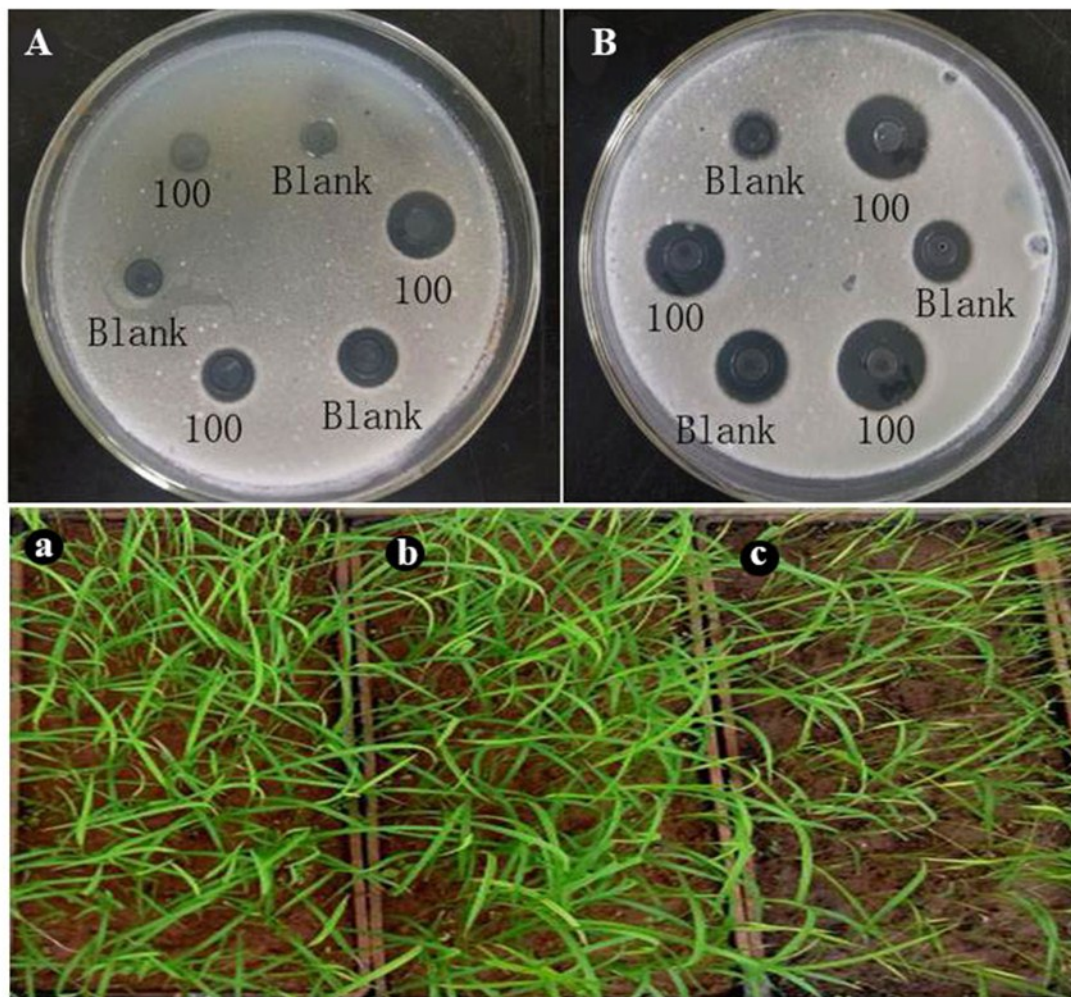


Fig. S1 The antifungal effect by adding of $100\mu\text{g}\cdot\text{mL}^{-1}$ micro/nano-biochars with water-dispersibility (A: the upper-layer biochar, B: the lower-layer biochar) and the effect of rice growth of rice nursery substrates containing (a: the upper-layer biochar, b: the lower-layer biochar, c: blank)

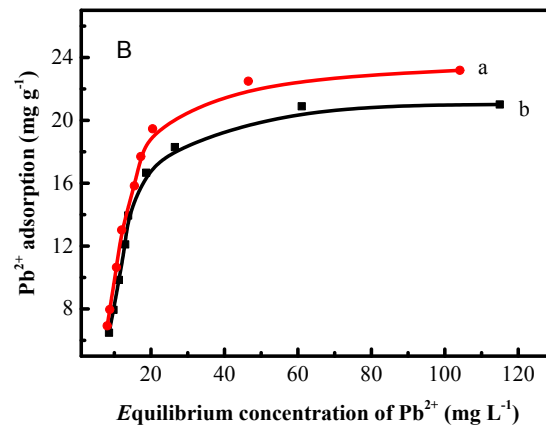


Fig. S2 Langmuir isotherm plots for the adsorption of Pb²⁺ onto the upper-layer (a) and the lower-layer (b) biochar with water-dispersibility and micro/nano-structure

Table S1 A comparison of the analytical performance of modified electrodes based on different materials for the electrochemical determination of Pb²⁺.

Materials	pH	Buffer solution	Linear rang	LOD	Referenc e
SnO ₂ /reduced grapheme oxide	5.0	0.1 M PBS	0 - 1.3 μM	18.39 nM	1
MWCNT/SP	5.0	0.11 M ABS	0 - 200 nM	23 nM	2
TiO ₂ -ZrO ₂ /PCE	3.0	0.1 M ABS	0.01 - 10 mM	7.6 μM	3
BiF-EPPGE	4.5	0.1 M ABS	0.48 - 1.44 μM	0.4 nM	4
Biochar/CPEM	5.0	0.1 M PBS	0.005 - 10 μM	9.8 nM	5
PBF/GCE	4.5	0.1 M ABS	1.3 - 13 mM	83 μM	6
Carbon nanotube/nafion	5.0	0.1M ABS	0.08 - 6 μM	5 nM	7
Bismuth oxide SPE	4.5	0.1 M ABS-HCl	48 - 720 nM	48 nM	8
Bi-GECE	4.5	0.1M ABS	97 - 770 nM	112 nM	9
Mercury film/SCPE	4.5	0.1 M HCl + 0.5 M NH ₄ AC	48.3 - 96.5 nM	4.83 nM	10
BiBE	5.0	0.1 M ABS	48.3 - 483 nM	0.506 nM	11
BINMSDE	4.5	0.1 M ABS	9.65 - 57.9 nM	3.38 nM	12
Biochars(nafion)/GCE	5.0	0.1 M ABS	0.02 – 8 μM 0.002 – 0.8 μM	6.8 nM 0.7 nM	This work

References

1. L.C.S. Figueiredo-Filho, B.C. Janegitz and O. Fatibelilo-Filho, *Anal. Methods*, 2013, **5**, 202.
2. R.T. Kachoosangi, C.E. Banks and X. Ji, *Anal. Sci.*, 2007, **23**, 283.
3. R.O. Kadara, N. Jenkinson and C.E. Banks, *Electroanal.*, 2009, **21**, 2410.
4. Ü.A. Kirgöz, S. Marín, and M. Pumera, *Electroanal.*, 2005, **17**, 881.
5. H. Li, J. Li and Z. Yang, *J. hazard. Mater.*, 2011, **191**, 26-31.
6. P.K.Q. Nguyen and S.K. Lunsford, *Talanta*, 2012, **101**, 110.
7. M.F.M. Noh and I. E. Tohill, *Sains. Malays*, 2011, **40**, 1153.

- 8 S.R. Prabakar, C. Sakthivel and S.S. Narayanan, *Talanta*, 2011, **85**, 290.
9. W. Song, L. Zhang and L. Shi, *Microchim. Acta*, 2010, **169**, 321.
- 10 T.M. Sugihiro, P.R. de Oliveira and E.I.P. de Rezende, *Bioresour. Technol.*, 2010, **143**, 40.
11. D. Sun and Z. Sun, *J. Appl. Electrochem.*, 2008, **38**, 1223.
12. Y. Wei, C. Gao, F.L. Meng, H.H. Li, L. Wang, J.H. Liu and X.J. Huang, *J. Phys. Chem. C.*, 2011, **16**, 1034-1041

Additive	Concentration ($\mu\text{g}\cdot\text{mL}^{-1}$) ¹⁾	Inhibition zone diameter (mm)
Blank	0	8.99 ± 0.70^b
Upper-layer biochar	50	9.13 ± 0.53^b
	100	11.30 ± 0.90^a
	250	9.945 ± 0.74^a
Lower-layer biochar	50	8.85 ± 0.20^b
	100	13.46 ± 0.31^a
	250	12.21 ± 1.92^c

Table S2 The antifungal effect by adding of as-obtained two biochars.

*Note: Multiple comparisons were done by Duncans new multiple range method test, and ^a, ^b, ^c mean values in the same line with different superscripts differ significantly 0.05 ($p < 0.05$).

Table S3 Langmuir constants for adsorption of Pb^{2+} on two biochars.

	K_L	q_m	R^2
Upper-layer biochar	0.0202	56.56	0.857
Lower-layer biochar	0.0260	41.67	0.834