

Accepted Manuscript

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PII: S0021-9797(18)31131-7
DOI: <https://doi.org/10.1016/j.jcis.2018.09.055>
Reference: YJCIS 24106

To appear in: *Journal of Colloid and Interface Science*

Received Date: 20 July 2018
Revised Date: 10 September 2018
Accepted Date: 17 September 2018

Please cite this article as: M. Song, Y. Zhou, X. Ren, J. Wan, Y. Du, G. Wu, F. Ma, Biowaste-based porous carbon for supercapacitor: the influence of preparation processes on structure and performance, *Journal of Colloid and Interface Science* (2018), doi: <https://doi.org/10.1016/j.jcis.2018.09.055>

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Biowaste-based porous carbon for supercapacitor: the influence of preparation processes on structure and performance

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Keywords: Biowastes, porous carbon, supercapacitor, hierarchical porous structure

Abstract: Here, a series of porous carbon based supercapacitor electrode materials have been synthesized by means of pyrolysis and hydrothermal methods combining with KOH activation using the biomass wastes mung bean husks as resources. The influence of synthesis process on the morphology, structure and supercapacitor performance of mung bean husks derived porous carbons has been investigated systematically. Especially, it is found that these oxygen-containing groups on the biochar play a crucial role in fabricating the three-dimensional (3D) hierarchical porous structure carbon. The original bio-structured porous carbon (PC₃₋₆₀₀), the 3D architecture porous carbon (HPC₂₋₇₀₀) and the porous carbon block (HPPC₂₋₇₀₀) have a high specific surface area, and the former mainly contains micropores and the latter two possess multistage pores. The specific capacitance of PC₃₋₆₀₀, HPC₂₋₇₀₀ and HPPC₂₋₇₀₀ is respectively up to 390 F g⁻¹, 353 F g⁻¹, 304 F g⁻¹ at 1 A g⁻¹, and still maintains as high as 287 F g⁻¹, 270 F g⁻¹ and 235 F g⁻¹ with corresponding retention ratio of 73.5%, 76.48%, 77.3% even at a high current density of 50 A g⁻¹.

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