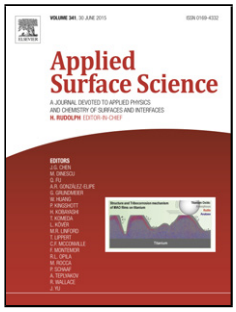

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PII: S0169-4332(16)30254-9
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2016.02.085
Reference: APSUSC 32603

To appear in: *APSUSC*

Received date: 10-11-2015
Revised date: 1-2-2016
Accepted date: 6-2-2016

Please cite this article as: S. Zhao, T. Yan, H. Wang, G. Chen, L. Huang, J. Zhang, L. Shi, D. Zhang, High capacity and high rate capability of nitrogen-doped porous hollow carbon spheres for capacitive deionization, *Applied Surface Science* (2016), http://dx.doi.org/10.1016/j.apsusc.2016.02.085

High capacity and high rate capability of nitrogen-doped porous hollow carbon spheres for capacitive deionization

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Abstract

In this work, nitrogen-doped porous hollow carbon spheres (N-PHCS) were well prepared by using polystyrene (PS) spheres as hard templates and dopamine hydrochloride as carbon and nitrogen sources. Field emission scanning electron microscopy (SEM) and transmission electron microscopy (TEM) images demonstrate that the N-PHCS have a uniform, spherical and hollow structure. Nitrogen adsorption-desorption analysis shows that the N-PHCS have a high specific area of 512 m^2/g. X-ray photoelectron spectroscopy result reveals that the nitrogen doping amount is 2.92 %. The hollow and porous structure and effective nitrogen doping can contributed to large accessible surface area, efficient ion transport and good conductivity. In the electrochemical tests, we can conclude that the N-PHCS have a high specific capacitance value, a good stability and low inner resistance. The N-PHCS electrodes present a high salt adsorption capacity of 12.95 mg/g at a cell voltage of 1.4 V with a flow rate of 40 mL/min in a 500 mg/L NaCl aqueous solution. Moreover, the N-PHCS electrodes show high salt adsorption rate and good regeneration performance in the CDI process. With high surface specific area and effective nitrogen doping, the N-PHCS is promising to the CDI and other electrochemical applications.

Keywords: *Carbon; Nitrogen doping; Electrosorption; Capacitive deionization*.