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Acidified Bamboo-Derived Activated Carbon/Manganese Dioxide Composite as a High-Performance Electrode Material for Capacitive Deionization

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Capacitive deionization (CDI) is an emerging desalination technology which employs high surface area porous electrode materials to eliminate ions from water by electrosorption. Herein, we propose an acidified bamboo-based activated carbon (BAC_a)/manganese dioxide (MnO_2) composite synthesize by a simple co-precipitation technique. Bamboo-based activated carbon exhibit high electrical conductivity, hierarchical pore structure, and large specific surface area, due to which it is regarded as a promising candidate for seawater desalination. In this work after acidification, significant amounts of oxygen-containing functional groups are introduced onto the surface of the carbon, which enhanced the hydrophilicity of whole composite, while the MnO_2 nanoparticles with sufficient ion migration channels provide a high adsorption capability and fast reaction kinetics. Consequently, the synthesized BAC_a/MnO_2 composite achieves a tremendous specific capacitance of 158 F g^{-1} at 10 mV s^{-1}, excellent electrosorption capacity of 10.3 mg g^{-1}, and outstanding recyclability in the application of CDI, which is in comparison better than that of bare bamboo-based activated carbon electrode. The present study endorses the promising application of the low-cost high-performance BAC_a/MnO_2 in capacitive deionization.

Keywords: biomass, activated carbon, acidification, manganese dioxide, capacitive deionization

FULL TEXT