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Three-dimensional hollow fiber type of carbon nanotube electrode for enhanced ion adsorption capacity

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ABSTRACT

In this study, a hollow fiber type of carbon nanotube (HF-CNT) network was fabricated as an electrode material for the improved ion removal in capacitive deionization (CDI). The Raman spectrum proved that the HF-CNT electrode synthesized by wet spinning and subsequent calcination techniques was composed of a porous CNT network. The Brunauer–Emmett–Teller surface area of the HF-CNT was 55.6 m^2/g, and specific capacitance was 23.8 F/g with excellent electrical stability in repeated current–voltage cycling. Accordingly, the HF-CNT electrode showed considerable electrosorption capacity of 58.2 mg/g (18.9 mg/cm^3) in an NaCl concentration of 500 mg/L at 1.2 V. The excellent electrochemical properties of the HF-CNT could be attributed to reduced resistance for ion transport and adsorption by its unique structure. In this study, the three-dimensional HF-CNT was confirmed as a new type of electrode in CDI, with excellent durability and high ion adsorption capacity.

Keywords: Carbon nanotubes; Three-dimensional electrode; Hollow fiber type of carbon nanotube network; Capacitive deionization

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