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Magnetic N-doped carbon aerogel from sodium carboxymethyl cellulose/collagen composite aerogel for dye adsorption and electrochemical supercapacitor

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ABSTRACT

Nitrogen-doped carbon aerogels derived from sodium carboxymethyl cellulose were prepared via a multistep approach involving sol-gel, freeze-drying, carbonization, and KOH activation processes; ferric trichloride and collagen were used as cross-linking agent and nitrogen source, respectively. The carbon aerogels exhibited well-developed porous three-dimensional morphologies, high specific surface areas, and excellent magnetic properties. When applied as electrode material, the CA-N0.5 showed a specific capacitance of 185.3 F/g at the current density of 0.5 A/g in a 6 M KOH electrolyte. The specific capacitance retention was 90.2% after 5000 charge/discharge cycles, indicating excellent cycling stability. In addition, the carbon aerogels showed excellent adsorption capacities of 238.2 and 230.4 mg/g for malachite green and methylene blue, respectively. These results suggest that N-doped carbon aerogels may be utilized as electrodes in supercapacitors as well as highly efficient contaminant adsorbents in aqueous solutions.

Keywords: Sodium carboxymethyl cellulose; Nitrogen-doped; Carbon aerogels;

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