Conducting polymer-based composite aerogels: synthesis and application for energy storage

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Conducting polymer-based aerogels represent new class of conducting macroporous materials which combine physicochemical properties of the conducting polymer with mechanical properties of a polymer support [1-3]. Polyaniline-poly(*N*-vinylpyrrolidone) aerogels with carbon nanofibers (PANI-CNF-PVP) were prepared via two steps [3]. First, PANI-CNF-PVP cryogels were prepared by oxidative cryopolymerization of aniline in water:isopropanol medium in the presence of various amounts of dispersed CNF (0.05–2.5 mg ml^{-1}). Second, prepared cryogels were converted to aerogels by freeze-drying. The effect of CNF incorporation on the resulting properties of aerogels were investigated by SEM, specific surface area, and electrical conductivity measurement. Additionally, the electrochemical performance (cyclic voltammetry, GCD, EIS) was explored in the assessment of potential synergistic interaction between the components of the aerogels and application for energy storage. Symmetrical supercapacitor with PANI–CNF–PVP aerogel as the electrode material was assembled. The device reached gravimetric capacitance of 213 F g^{-1} with energy and power densities of 30 Wh kg^{-1} and 1000 W kg^{-1}, respectively, and showed 95% cycling stability after 1000 cycles.

Keywords: conducting polymers, aerogels, supercapacitors

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