EDLC Aapplication of Carbon Nanofibers/Carbon Nanotubes Electrode Prepared by Electrospinning

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The electrospinning method [1] was introduced to prepare nanostructured composites of PAN (polyacrylonitrile) nanofiber and multiwalled carbon nanotubes (MWCNT) in a form of a paper with almost mono-disperse diameters of 500 nm (or less). The webs were oxidatively stabilized in air followed by an activated process with steam, resulting in activated carbon fibers (ACFs). The ACF webs were characterized by pore structure, specific surface area, and electrical conductivity, which would be related to the specific capacitance of the electrical double layer capacitor (EDLC). The electric double layer capacitance of these ACFs was measured in 30 wt.% KOH aqueous electrolyte.

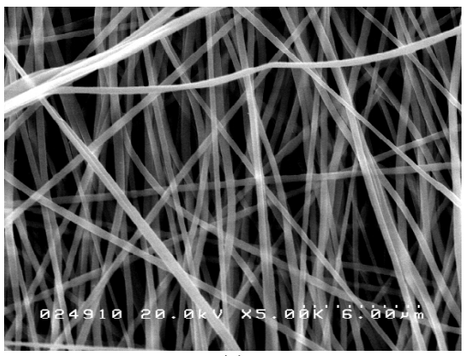
Figure 1 shows SEM micrographs of electrospun (a) PAN nanofiber webs and (b) PAN with 10 wt.% MWCNT. The nanofibers are partially aligned parallel to the winding direction. The average diameter of the PAN and PAN with MWCNT fibers are 300nm and 500nm, respectively.

Figure 2 shows a discharge curves at various current densities. The capacitance was shown to increase with the MWCNT content of 10 wt.% from 82 F/g to 160 F/g at the activation temperature of 900 ^{o}C and the current density at 5 mA/cm^2. These results may be related with the specific surface area, the pore size distribution, and the electrical conductivity of the electrodes.

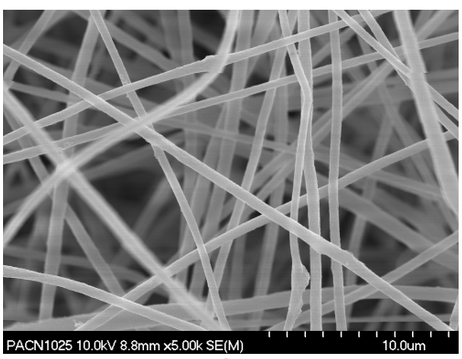
Our results show a simple and economical means that can substantially enhance the capacitance of nanostructured composites.

Reference

1. J. Doshi and D. H. Reneker, *J. Electrostatics*, 35, 151(1995).



(a)



(b)

Fig. 1. SEM micrographs of electrospun fibers (a) PAN and (b) PAN with CNT.

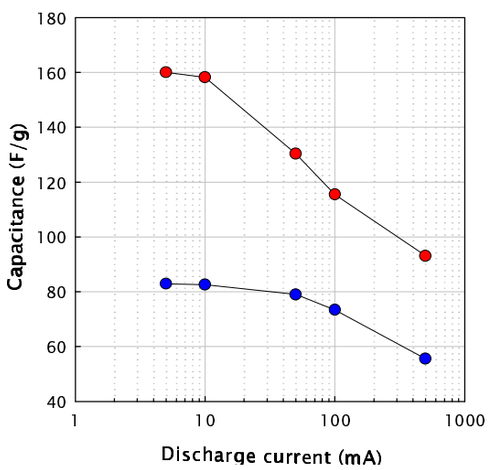


Fig. 2. Variation of specific discharge capacitance with discharge current for PAN and PAN/MWCNT electrodes.

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