Nanocarbon Electrodes for Symmetric and Hybrid Capacitors

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The choice of carbons for aqueous-electrolyte electrochemical capacitors has expanded with the advent of carbon nanotubes, which can be well-suited for ECs due to their accessible surface area. In this paper we report electrochemical impedance data for select single- and multi-wall nanotubes with different morphologies. These varieties exhibit a range of capacitances and powers, and also show differences depending on whether the electrolyte is acid or base.

Nanotube-based electrodes are then used to prepare two prototypes designed for specific requirements. The first is a symmetric carbon/carbon capacitor (acid electrolyte) tailored to deliver a pulse as short as 5 milliseconds. Some of the design factors pertinent to the fabrication of this prototype are discussed (choice of material, electrode thickness etc.), as well as the energy/power features of the unit.

The second prototype is a NiOOH/carbon hybrid with KOH electrolyte, a unit designed for a general combination of energy and power. Again the design and characterization of the unit are discussed, as well as the carbon electrode properties that affect the overall device performance.