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Relation between texture and high-rate capacitance of oppositely charged microporous carbons from biomass waste in acetonitrile-based supercapacitors

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Abstract

A biomass-derived activated carbon with a systematic control over the pore size distribution is used to decode the effect of pore size distribution on charge dynamics in organic acetonitrile-based supercapacitors. Distinct trends in the high-current capacitance of the positive and negative electrodes are revealed by isolating the ion-specific accessible pore width and specific surface area from the total values calculated on the basis of low-temperature nitrogen adsorption/desorption isotherms. A size match between ions and pores for each separate electrode is established to maximize gravimetric capacitance under high current load. Most importantly, the high-current gravimetric capacitance demonstrates the existence of an optimum micropore width depending on polarization as well as no need for wide micropores or mesopores for ensuring rapid capacitive response.

Keywords

Supercapacitors; Microporous carbons; Organic electrolyte; Rate capability; Biomass