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Studies on the equivalent serial resistance of carbon supercapacitor

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Abstract

Equivalent serial resistance (ESR) is a crucial factor to effect on the density of power and energy for supercapacitor. In this work, we studied the influence of internal and external factors, including mechanical pressure, temperature, electrolyte concentration and loaded voltage on the performance parameters, especially on the ESR and specific capacitance for carbon supercapacitor. The results indicate that the ESR is mainly contributed from the interface between electrolyte and electrode. In addition, we found that the ESR can be significantly lowered by mechanical pressures from 11ohm at 0 N to 1 ohm at 800 N by decreasing 90%, and in consequence, the specific capacitance of supercapacitor can be improved dramatically from 19.34 F/g to 44.87F/g by increasing 128%. Basing on the model of interface with a diffusion layer, we put forward a reasonable explanation for the variation of ESR and specific capacitance with the four factors of pressure, temperature, electrolyte concentration and loaded voltage.

Keywords: Supercapacitors, Energy storage, Carbon electrode material, Equivalent serial