

Polymerspolyaniline/CMK-3/Hydroquinone Composite Electrode for Supercapacitor Application

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Abstract : In this study, carbon mesoporous material, CMK-3, was adopted as supporting material for electroactive polymerspolyaniline (PANI), polyaniline, for supercapacitor application, where hydroquinone (HQ) was integrated to enhance the redox reaction of PANI. The results show that the addition of PANI improves the capacitance of electrode from 89 F/g (CMK-3) to 337 F/g (PANI/CMK-3), the addition of HQ furtherly improves the capacitance to 463 F/g (PANI/CMK-3/HQ). The PANI provides higher energy density and also acts as binder of the electrode; the CMK-3 provides higher electron double layer capacitance EDLC and stabilize the polyaniline by its highly porosity. With the addition of HQ, the capacitance of PANI/CMK-3 was further enhanced. In-situ analyses including cyclic voltammetry (CV), chronopotentiometry (CP), electron impedance spectrum (EIS) analyses were applied for electrode performance examination. For materials characterization, the crystal structure, morphology, microstructure, and porosity were examined by X-ray diffraction (XRD), scanning electron microscope (SEM), and transmission electron microscopy (TEM), and 77K N₂ adsorption/desorption analyses, respectively. The effects of electrolyte pH value, PANI polymerization time, HQ concentration, and PANI/CMK-3 ratio on capacitance were discussed. The durability was also studied by long-term operation test. The results show that PANI/CMK-3/HQ with great potential for supercapacitor application. Finally, the potential of all-solid PANI/CMK-3/HQ based supercapacitor was successfully demonstrated.

Keywords : CMK3, PANI, redox electrolyte, solid supercapacitor

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