

Direct Electrophoretic Deposition of Hierarchical Structured Electrode Supercapacitor Application

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Abstract : In this study, Co₃O₄-CNT-Graphene composite electrode was deposited by electrophoretic deposition (EPD) method, where micro polystyrene spheres (PSs) were added for co-deposition. Applied with heat treatment, a hierarchical porosity is left in the electrode which is beneficial for supercapacitor application. In terms of charge and discharge performance, we discussed the optimal CNT/Graphene ratio, macroporous ratio, and the effect of Co₃O₄ addition on electrode capacitance. For materials characterization, scanning electron microscope (SEM), X-ray diffraction, and BET were applied, while cyclic voltammetry (CV) and chronopotentiometry (CP) measurements, and Ragone plot were applied as in-situ analyses. Based on this, the effects of PS amount on the structure, porosity and their effect on capacitance of the electrodes were investigated. Finally, the full device performance was examined with charge-discharge and electron impedance spectrum (EIS) methods. The results show that the EPD coating with hierarchical porosity was successfully demonstrated in this study. As a result, the capacitance was greatly enhanced by 2.6 times with the hierarchical structure.

Keywords : supercapacitor, nanocarbon tub, graphene, metal oxide

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