Hybrid nanocomposite multilayers based on carbon material/transition metal oxide for supercapacitor electrode with high electrochemical performance

고용민, 조진한†
고려대학교
(jinhan71@korea.ac.kr†)

Thin-film supercapacitor electrodes with high electrochemical performance based on carbon materials (CNT or reduced-graphene)/oleic acid stabilized-transition metal oxide nanoparticle (OA-TMO NP) multilayers were prepared using covalent bonding-induced layer-by-layer (LbL) assembly. Well-defined TMO NP dispersed in non-polar media is densely adsorbed onto conductive carbon materials via direct-covalent bonding without the aid of non-active binder or insulating NP ligands due to the high affinity between the TMO NP and the functional groups (-NH2 or -SO3-) of carbon materials. Our approach can be minimized the interface resistance between the NPs and the electrolyte, and the resulting volumetric capacitance and stability were significantly enhanced. The formed electrodes showed high volumetric capacitance of 248 for (CNT/OA-Fe3O4 NP)n, 280 for (rGO/OA-Fe3O4 NP)n, and 305 F•cm-3 for (CNT/OA-MnO NP)n at 5 mV•s-1, respectively. Furthermore, these electrodes exhibited remarkable stability.