Three-dimensional graphene anchored FeO$_3$@C core-shell nanoparticles as supercapacitor electrodes

Three-dimensional (3D) reduced graphene oxide (rGO) anchored carbon-coated FeO$_3$ core-shell nanoparticles (FeO$_3$@C-rGO) has been developed successfully through a simple one-pot hydrothermal process followed by a further annealing treatment. The 3D FeO$_3$@C-rGO nanocomposite consists of carbon-coated FeO$_3$ nanoparticle clusters (FeO$_3$@C) and rGO nanosheets. The homogenously distributed and intercalated FeO$_3$@C nanoparticles between rGO nanosheets form a highly conductive 3D carbon network with rGO, and present a hierarchical pore size structure, enabling fast ion and electron transport, as well as remarkable specific surface area. The electrochemical performance in supercapacitor has been characterized, and the as-prepared FeO$_3$@C-rGO electrode shows a significant high specific capacitance of 211.4 F/g at 0.5 A/g and 177.2 F/g at 20 A/g with no visible performance decay even after 2500 cycles testing. These properties indicate a good potential to achieve high performance electrochemical devices.