

Comparative investigation on the electrochemical performances of graphene and graphene/CNT composites for supercapacitor electrode

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There are three types of supercapacitors, which are electric double layer capacitor (EDLC), pseudocapacitor and hybrid capacitor. Among above supercapacitors, much attention was focused on EDLC, because of long cycle life, high charge/discharge efficiency and environmentally friendly property. For EDLC electrode, CNT was composited with reduced graphene oxide (RGO) to enhance the electrochemical performances of graphene based-supercapacitor by preventing the graphene layers from restacking during reduction process. SEM and TEM were used to observe the morphologies of RGO and RGO/CNT composite. And Raman spectrum was utilized in order to compare the defect quantity of GO and RGO in the hexagonal lattice structure by comparing the intensity ratios I_D/I_G of two materials. TGA analysis was performed to observe the mass change of GO, RGO and RGO/CNT composite with increase of temperature. Electrochemical tests were conducted by using cyclic voltammetry and impedance spectroscopy. The specific capacitance of RGO/CNT composite was 124.0 F/g (at a scan rate of 30 mV/s), which is almost 1.5 times higher than that of RGO only, and 83.8 % of initial capacitance was maintained after 30,000 cycles so far.