Facile synthesis of graphene sheets intercalated by carbon spheres for high-performance supercapacitor electrodes

ABSTRACT

The composites consisting of graphene oxides (GOs) and carbon spheres (CSs), which were hydrothermally derived from the aqueous solution of glucose with average diameter of 200 nm, were mechanically mixed, and the GOs/CSs (GCSs) were thermally treated at high temperatures in the range of 700–900 °C. In the GCS composites, the CSs as spacers located between the GO sheets prevent the aggregation and restacking of graphene sheets. The GCS composites (GO/CS = 1) treated at 800 °C (GCS@800) have the high specific capacitances of 272.8 and 197.5 F g−1 in a three-electrode cell at the current density of 0.2 and 10 A g−1, respectively, in 6 M KOH aqueous solution, and demonstrated high rate capability and good cycling stability. The excellent electrochemical performance of the GCS@800 electrode is attributed to its structure with hierarchical porous structures including overwhelming micropores and a few of macropores. This work provides an effective and simple technique by integrating CSs and graphene sheets into composite structures for high-performance energy storage devices.