High quality reduced graphene oxide through repairing with graphene ball nanostructures

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Graphene has a high surface area (~2630 m2/g), superior electron mobility (~200,000 cm2/V), mechanical strength and chemical stability, so that considered as a highly promising material for various applications such as an anode material of batteries, transparent conductive electrode, and supercapacitors. Most of large scale graphene-based application use a suspension or colloidal dispersion of graphene oxide (GO) or reduced graphene oxide (rGO). However, the oxidation process introduces significant defects in the as-made graphene, degrading its unique properties. Here, we report on the fabrication of repaired graphene/graphene ball (RGGB) with high electrical conductivity and specific surface area via a CVD approach. In this synthesis, graphene ball was formed on the graphene oxide sheets, which prevent the agglomeration of graphene sheets, so that RGGB shows large specific surface area. During the CVD process, defects of graphene oxide sheets are highly repaired, so the resulting graphene sheets have high electrical conductivity in bulk. The repaired graphene/graphene ball (RGGB) shows the good performance in EDLC resultant from the large surface area and the high electrical conductivity of repaired graphene.