

Graphene Base Invert Solar Cells with Highly Conductive and Dispersible Pyrenecarboxylic Acid-Grafted Graphene Oxides

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A novel, simple low-temperature reduction method without annealing is proposed for highly conductive and dispersible graphene sheet. This method consists of the grafting of graphene oxide (GO) with 1-pyrenecarboxylic acid (PCA), the exothermic reduction of PCA-grafted GO with a minimal amount of hydrazine, and the endothermic deoxygenation by NaOH with reflux. The reduced PCA-grafted graphene oxide (rGO/PCA) yielded considerably high solubility and conductivity of $\sim 1.52 \times 10^5$ S/m vis-à-vis that of pristine graphene (i.e., 1.59×10^5 S/m). The solar cell fabricated using the mixture of rGO/PCA and P3HT as active layer and electron extraction layer showed power conversion efficiency ten times larger than that only with P3HT.