Graphene-based Nanohybrid Materials as the Pt-free Counter Electrode for Highly Efficient Dye-sensitized Solar Cells

다오반[1], 최호석[1,*], Liudmila L. Larina[1,2], 이중기[3]
[1]충남대학교; [2]Institute of Biochemical Physics; [3]KIST
(hchoi@cnu.ac.kr*)

Due to their low fabrication cost, environmentally benign process, and relatively high energy conversion efficiency, dye-sensitized solar cells (DSCs) have attracted considerable attention as a next-generation solar cell. One of the issues with DSCs is the need to improve the generation of iodide from the triiodide existing in the counter electrode (CE). Pt is considered to be one of the best materials as a CE for DSCs. However, the scarcity and high cost of Pt limits the mass production of these types of DSCs. Herein, we present a strategy which easily, continuously, uniformly and stably hybridizes RuO_2-NPs on the surface of reduced graphene oxide (RGO) with simultaneous co-reduction of Ru precursor ions and graphene oxide to Ru atoms and RGO, respectively, through dry plasma reduction under atmospheric pressure and at low temperature without using any toxic chemicals. Since RuNPs are more susceptible to oxidation, Ru atoms located on the surface of RuNPs are further oxidized to RuO_2 in atmosphere. It is expected that the RuO_2-NP/RGO nanohybrids will show high catalytic activity and conductivity for regenerating I^- from I_3^- at the CE of DSCs.