Synthesis of bimetallic PtNi nanoparticles and their applications as an efficient counter electrode of dye-sensitized solar cells

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We present the synthesis of bimetallic PtNi nanoparticles (NPs) on the transparent conducting oxide (TCO) substrate by using dry plasma reduction under atmospheric pressure at low temperature process and without using any toxic reagents. Furthermore, these alloy are employed as counter electrodes (CEs) for highly efficient dye-sensitized solar cells (DSCs). For this purpose, we designed an experimental approach for co-reduction of metal precursors with different volume ratio. As the results, the bimetallic PtNi NPs, with small particle size, are successfully immobilized and well-distributed on the surface of TCO without any agglomeration. The electrochemical catalytic activity and photovoltaic performances indicated that the improvement of both conductivity and catalytic activity to reduce triiodide to iodide ions were obtained with developed CEs in comparison with Pt NP and Ni NP CEs.