Application to Counter Electrode for liquid-junction photovoltaic devices by synthesis of PtSe binanoparticles using atmospheric pressure plasma

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This study presents the synthesis of PtxSe1-x(0≤x≤1) nanoparticles (NPs) with a different volume ratio of Pt and Se in mixture precursor solutions on the transparent conducting oxide electrode by using dry plasma reduction under atmospheric pressure without using any toxic chemicals and at a low temperature. The developed PtxSe1-x(0≤x≤1) NPs-immobilized on FTO glass substrate are first employed as counter electrodes (CEs) for efficient dye-sensitized solar cells (DSCs). As a result, the lowest charge transfer resistance of 0.85 Ω is obtained for CE prepared at the volume ratio of Pt and Se precursor of 9:1. Therefore, the device fabricated with Pt0.9Se0.1 alloy electrode shows the highest efficiency of 5.91% among all cells under study. This is also higher than those of 5.54%, and 0.13% efficiency for cells fabricated with Pt NP and Se NP CEs, respectively. The obtained results indicate there has a potential use of PtSe alloy CEs in robust and efficient DSCs.
Keyword: dry plasma reduction; PtSe bimetallic nanoparticles; counter electrode; dye-sensitized solar cells.