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Synthesis and characterization of bismuth oxyiodide-sensitized TiO_2 electrodes for solar energy conversion

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Bismuth Oxyiodide (BiOI) have recently gained considerable attention as a non-toxic sensitizing material in the solar energy conversion process. Usually, in dye-sensitized solar cells, Ru-based dyes are used as sensitizers and they are high-cost materials. In the present work, BiOI nanofilms were deposited on TiO_2 nanoporous electrodes by the Successive Ionic Layer Adsorption and Reaction (SILAR) method and the optical and electrical properties have been studied. BiOI film shows better absorption in the visible region of the solar spectrum. In order to find the suitable number of SILAR cycles for high-performance BiOI-sensitized solar cells, FTO/TiO_2/BiOI/electrolyte/Pt type solar cells have been fabricated and characterized. Iodide/triiodide redox couple-based liquid has been used as electrolytes in solar cells. TiO_2 electrode fabricated with 15 SILAR cycles of BiOI shows a maximum power conversion efficiency of 0.54% while N719 dye-sensitized solar cell shows an efficiency of 3.39% under the simulated light of 100 mW cm^{-2} with AM 1.5 spectral filter. However, N719 dye is an expensive commercial dye and BiOI is a new low-cost alternative sensitizer for dye-sensitized solar cells.

Keywords: *Bismuth oxyiodide, dye-sensitized solar cell, photoanode, sensitizer, successive ionic layer adsorption and reaction*

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