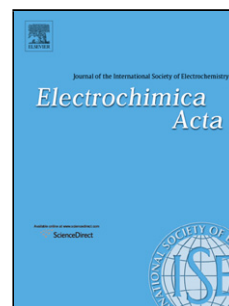


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An efficient binary ionic liquid based quasi solid-state electrolyte for dye-sensitized solar cells

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ABSTRACT: A novel binary ionic liquid electrolyte containing lithium bis(trifluoromethanesulfonyl) imide (LiTFSI) and binary ionic liquids, which is composed of 1-butyl-3-methylimidazolium iodide (BMII) and 1-butyl-3-methylimidazolium thiocyanate (BMISCN), is developed for dye-sensitized solar cells (DSSCs). It is found that incorporation of LiTFSI as charge transfer promoter with BMII has positive effect on the interfacial charge transfer of the dye/TiO₂ film, further addition of BMISCN into the above composite electrolyte can take advantage of its low viscosity to enhance the ionic conductivity and reduce the interfacial charge transfer resistance, and a photovoltaic conversion efficiency of 5.55% is obtained from the solar cell fabricated with the optimized binary ionic liquid electrolyte without iodine participation under AM 1.5 illumination at 100 mW cm⁻², with a 108.6% improvement in the efficiency with lower resistance and higher ionic conductivity as compared to the solar cell fabricated with single BMII ionic liquid-based electrolyte. The above results should be attributed to the reduced charge recombination and the effective interfacial charge transfer in the solar cell.

Keywords: Ionic liquid electrolyte, dye-sensitized solar cell, photovoltaic conversion efficiency, charge transfer promoter, charge transfer mediator

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