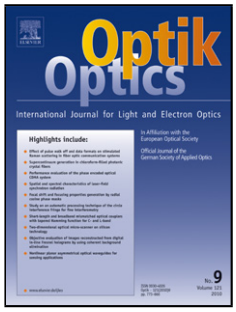

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Investigation of the Influence of Different Hole-Transporting Materials on the Performance of Perovskite Solar Cells

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Abstract:

The use of polymer layers as hole transport materials has been recomended to amlify the resistance to degradation of methylammonium perovskite solar cells. Polymeric materials have been investigated but with little achievement as they lead to a lower conversion efficiency than the values attained using Spiro-OMETAD. In this paper, perovskite solar cells are reported to have been numerically simulated using SCAPS-1D and AMPS-1D. It is a study of the influence of thickness of absorbers and hole transporting materials (HTM) as well as holes density and temperatur on short-circuit current density (J_{SC}), open-circuit voltage (V_{OC}), fill factor and efficiency. Also, J-V characteristics and quantum efficiency are calculated in five types of HTMs (i.e. Spiro-OMETAD, PEDOT PSS, NPB, MEH-PPV, P_3HT) and without an HTM layer. There is an improvement observed in the solar cell efficiency as compared to the standard Spiro-MeOTAD buffer based on solar cell configuration.The observation suggests the possibility of using PEDOTPSS for HTM conversion efficiency, and, thus, a replacement is found for the expensive and moisture-sensitive Spiro-OMETAD.

Keywords: Perovskite solar cells, Polymeric materials, Device simulation, Buffer layes