Effect of hole transport layer thickness on planar hetero-junction Perovskite solar cells

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From 2009, perovskite solar cells made a huge revolution in the emerging photovoltaic research field. With very simple device structure, the power conversion efficiency was rapidly increased from 3.8 % to 20 %. Even, the perovskite materials, 'CH_3NH_3I', 'PbI_2', '$PbCl_2$', '$PbBr_2$', are considered cheap enough to achieve the reliable next generation energy source. Planar structured perovskite solar cells have strong advantages because of their simple device making process as well as flexibility that we can replace materials of electron transport layer (ETL) and hole transport layer (HTL) to other materials which are commonly used in organic solar cells. For making optimized solar cells, there should be the thickness tuning of the buffer layers.

In this work, we varied the thickness of the hole transport layer (HTL) 'Spiro-MeoTAD' for making the optimized perovskite solar cells. We changed the thickness by controlling the concentration of the Spiro-MeoTAD solution from 45 mg/mL to 150 mg/mL. Also, we investigated the doping effect of different amount of lithium bis-trifluoromethanesulfonimide (LiTFSi) on the solar cell performance. Based on the systematic analysis of the photovoltaic performance and optical characteristics with the different thickness of the HTL, we obtained the optimal condition of HTL for the planar hetero-junction perovskite solar cells.

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