Performance enhancement of mesoscopic $CH_3NH_3PbI_3$ perovskite hybrid solar cells by Li assisted hole conduction

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Solar energy has received a great deal of attention as promising alternative energy source because it is clean, abundant, sustainable, and renewableinfinite. To date, the innovative perovskite solar cells reducing power generation cost down to conventional fossil fuels were reported and intensive studies are being done. Therefore, it is an important research issuearea to understand the working principle of the perovskite solar cells in order to design highly efficient increase the device structures.solar cell efficiency. To develop efficient solar cells, we studied the effect of Li-TFSI (Li-bis(trifluoromethanesulfonyl) imide) and t-BP (4-tert-Butylpyridine) additives added in P3HT(poly-3-hexylthiophene) on device performance. To prove effect of additives, we spin-coated P3HT with additives and without additives on $CH_3NH_3PbI_3$/mesoporous-TiO_2 (mp-TiO_2)/blocking-TiO_2 (bl-TiO_2)/F doped tin oxide (FTO) substrate. By including Li-TFSI/t-BP additives in P3HT, we showed better hole conductivity than P3HT without additives and could greatly increase the device efficiency from 6.5% to 14.2% at 1 sun condition.