Study of different hole transporting materials for hybrid perovskite solar cells

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Communication

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Over the last years, interest for organolead trihalide perovskite materials (ABX_3 where A is an ammonium cation, B a metal cation and X an halide) as light absorber in solar cells has increased continuously[1]. One of the most studied hybrid perovskite material is methylammonium lead triiodide ($MAPbI_3$) leading to 15 to 20% efficiencies in a FTO/TiO_2/mp-TiO_2/$MAPbI_3$/Au structure[2,3].

A new method for preparation and one-step process deposition of the perovskite material[4] is here used in a planar heterojunction FTO/compact-TiO_2/$MAPbI_3$/HTM/Au structure leading to 11% efficiency (on 0.28 cm² cell) when Spiro-MeOTAD is used as HTM (J/V curve Figure 1 (left)). Five new spiro-based HTM (Figure 1 (right)) are then compared to this reference system.

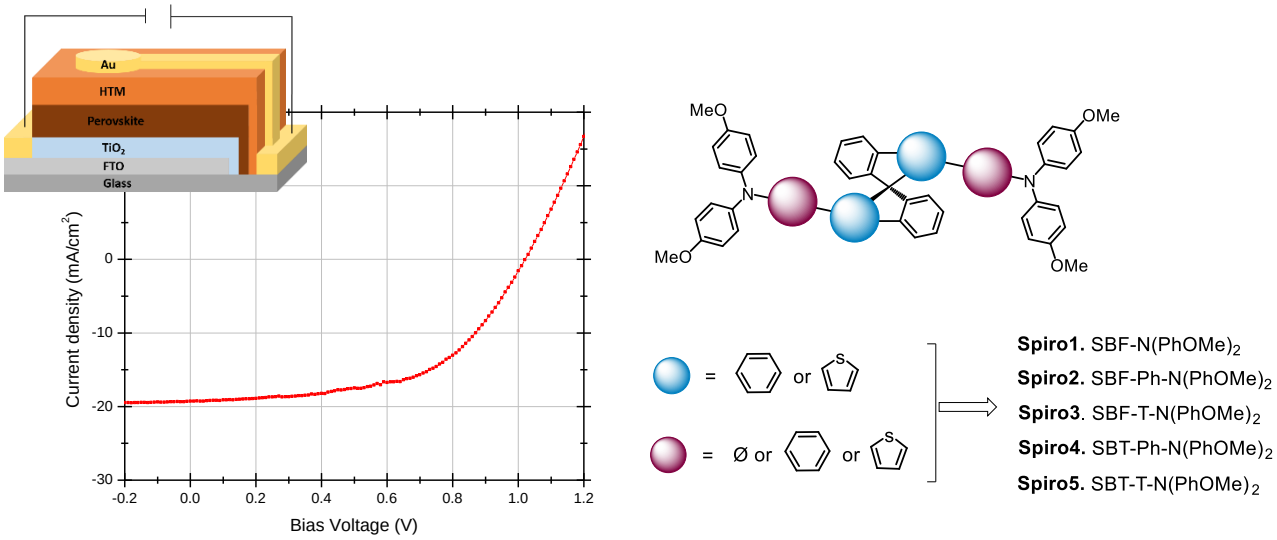

Figure 1. General cell architecture and J/V curve when Spiro-MeOTAD is used as HTM in this structure (left) and Structures of the five new HTM (right)

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[2] Burschka, J., et al. (2013). "Sequential deposition as a route to high-performance perovskite-sensitized solar cells." Nature 499(7458): 316-319
[3] Gao, P., et al. (2016). "A molecularly engineered hole-transporting material for efficient perovskite solar cells." Nature energy.
[4] Jeon, N. J., et al. (2014). "Solvent engineering for high-performance inorganic-organic hybrid perovskite solar cells." Nature Materials 13(9): 897-903