

Charge Carrier Accumulation Studies in Organic-Inorganic Lead Halide Perovskite Solar Cells

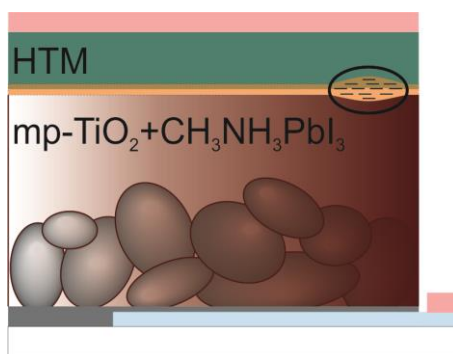
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The rapid development of organometal halide perovskite solar cells since six year ago become an attractive technology to be an alternative to conventional photovoltaic solar cells.¹ Solid state solar cells with high efficiencies over 21%, numerous new materials and interfaces, easy fabrication, and alternative device configurations are the reasons of their mayor progress so far.² However, there are still some issues that should be addressed to well understand the working mechanisms of these devices. The electrical processes such as carrier transport into the perovskite film and charge extraction at the interfaces as well as electric field that occurs in the timescale of seconds are still under debate.³ In particular, we focus this study on the charge accumulation located at the interfaces of the mesoscopic perovskite hybrid solar cells which hinders a proper carrier extraction at electrodes. Several absorber semiconductors as well as hole transport materials were analyzed in order to study a complete analysis based on chemical interfacial reactions, work functions and transport properties. To that end, current-voltage curves under dark and specific experimental conditions were carried out, for instance, reverse bias direction and voltage-time preconditions. It is highlighted that a non-common diode shape was observed which pattern can be controlled by the materials used to the preparation of the solar cell and the prior experimental conditions.



Scheme 1. Schematic illustration explaining an alternative to store charge carrier as located traps between the absorber and the hole transport materials (HTM) in a complete TiO₂ scaffold perovskite solar cell.

References

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