

## Molecular solar cells: From Dyes to Hybrid Semiconductors

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During my lecture I will present our latest results<sup>1,2</sup> on the characterization of different type of solar cells from DSSC and OPV to MAPI using advanced photo-induced time resolved techniques. Using PICE (Photo-induced charge extraction), PIT-PV (Photo-induced Transient PhotoVoltage) and other techniques, we have been able to distinguish between capacitive electronic charge, and a larger amount of charge due to the intrinsic properties of the perovskite material. Moreover, the results allow us to compare different materials, used as hole transport materials (HTM), and the relationship between their HOMO and LUMO energy levels, the solar cell efficiency and the charge losses due to interfacial charge recombination processes occurring at the device under illumination. These techniques and the measurements carried out are key to understand the device function and improve further the efficiency and stability on perovskite MAPI based solar cells (Figure 1).

### References

- [1] J. Jiménez-López, BDM Pusher, Dirk M. Guldi, E. Palomares. *J. Am. Chem. Soc.* 2020, 142 (3) 1236.
- [2] E. Yalcin, M. can, C. Rodríguez-Seco, E. Aktas, R. Pudi, W. Cambararu, S. Demic, E. Palomares. *Energ. Environ. Sci.*, 2019, 12, 1 230.

### Figures

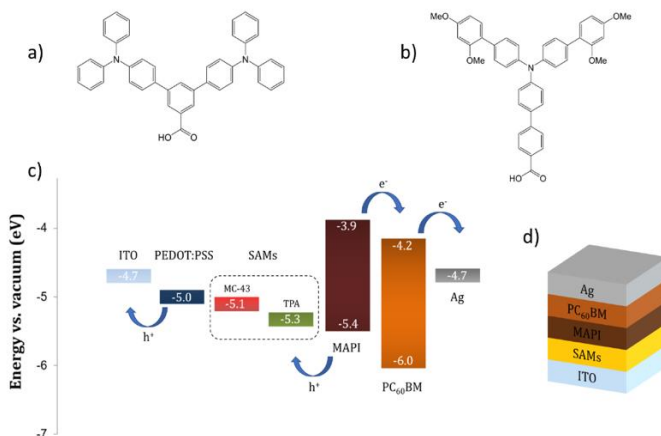


Figure 1. Use of self-assembled molecules as selective contacts in methyl ammonium lead iodide (MAPI) perovskite solar cells.