PhotOnline'2023
Web-conference organized by and for young researchers – 2nd edition

Phenothiazine and carbazole based stable hole-transporting materials for Emerging Hybrid Photovoltaics

V. Maruzzo*[a,b], Barbero,[b] A. Bousquet,[a] C. Lartigau-Dagron [a].

[a] *Université de Pau et des Pays de l'Adour, E2S UPPA, CNRS, IPREM, Pau, France*

[b] *Department of Chemistry, NIS Interdepartmental and INSTM Reference Centre, University of Torino, 10125, Torino, Italy*

**valentina.maruzzo@univ-pau.fr*

Keywords: Perovskite based solar cells, Holes Transporting materials (HTMs), small molecule HTMs, polymer HTMs

Perovskite based Solar Cells (PSCs) experienced a fast progress in the research, suggesting their great potential. Indeed, in few years an impressive efficiency of 25.5% has been reached, that has been further increased to 30% with Perovskite/Si tandem device architectures.[1] Good device performances are achieved with the presence of an Electron Transporting Material (ETM) and a Hole Transporting Material (HTM) surrounding the photoactive Perovskite layer: they drain efficiently the light-generated charges towards the corresponding electrodes.

However, the industrial production of PSCs is still hampered by their low long-term stability.[2] In particular, the salts used for doping of HTMs are highly hygroscopic, thus favouring the degradation of the Perovskite layer. In this context, the project of the research is focused on finding new "low dopant" or "dopant-free" conductive HTMs [3], possessing passivation properties toward the photoactive layer to reduce the degradation induced by both light and extrinsic factors. Starting from phenothiazine and carbazole scaffolds, low-cost materials with favourable and easily tuneable electronical properties, small molecule and polymer HTMs will be synthesized. In the present work, the 3,3'-(9-hexyl-9H-carbazole-3,6-diyl)bis(10-hexyl-10H-phenothiazine) (A) and 10-hexyl-3,7-bis(9-hexyl-9H-carbazol-3-yl)-10H-phenothiazine (B) were synthesized and structurally, optoelectronically and electrochemically characterized. Both molecules demonstrated to have HOMO values well suited for their application in PSCs.

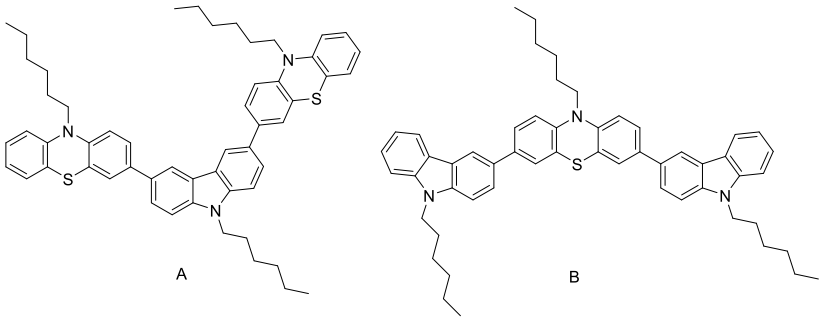

Figure 1. Small molecules HTMs.

[1] https://www.nrel.gov/pv/cell-efficiency.html.

[2] C. C. Boyd, R. Cheacharoen, *Chem Rev*, **2019,** 119, 3418-3451.

[3] M. M, H. Desoky, M. Bonomo, *Energies*, **2021,** 14, 2279 - 2328.