PC-52

Synthesis and characterization of polymers as HTMs for perovskite solar cells

M.M.H. Desoky,[a] P. Quagliotto,[a] C. Barolo,[a] M. Bonomo,[a] G. Viscardi,[a] A. Di Carlo,[b] N. Yaghoobi Nia[b]

[a]*Dipartimento di Chimica, Università degli Studi di Torino, via P. Giuria 7, Torino, 10125, Italy*
[b]*CHOSE. (Centre for Hybrid and Organic Solar Energy), University of Rome "Tor Vergata", via del Politecnico 1, Rome 00133, Italy*
mohamedmgadyhassan.desoky@unito.it

Among alternative energy sources, Perovskite Solar Cells (PSC), raising in efficiency from 3.2% to 22-23% in only few years,[1] are the new frontier of the photovoltaic research. The polymeric Hole Transport Materials (HTM) extract holes and protect perovskite from moisture degradation due to their superior sealant ability.[2] We prepared several P3HT and PTAA conductive polymers. P3HT structure was modulated in molecular weight (20 to 300 kDa) and regioregularity (78-100%), to search for correlations between structure and solar cell efficiency.[3] The P3HT were prepared by different synthetic methods (oxidative,[4] C-H activation[5] and Grignard Methatesis[6]).

The PTAA were prepared by polymerization of dibromo-substituted linkers with different anilines, with a Pd catalyst bearing a NHC ligand,[7] obtaining polymers with short to medium molecular weight. Upon characterization, the polymers showed a very good stability and the estimation of energy levels was compatible with the most common perovskites used in perovskite solar cells. Those HTMs were used in crystal engineering perovskite[8] solar cells, reaching a photoconversion efficiency of 17% and 13.4% respectively, confirming their good potential as HTMs for PSCs.

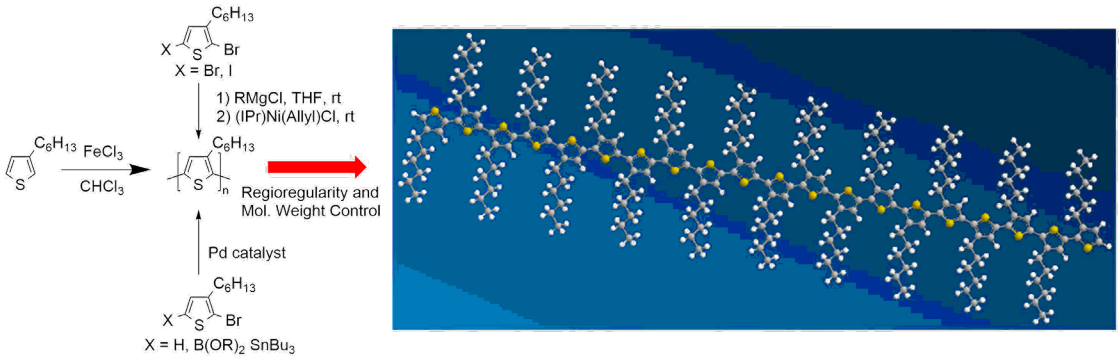

Figure 1: Different synthetic methods for P3HT.

Acknowledgements

This work was supported by the Italian Ministry of Economic Development in the framework of the Operating Agreement with ENEA for Research on the Electric System.

References:

[1] M. Green, A. Ho-Baillie, *ACS Lett.* **2017**, *2*, 822-830.
[2] W. Zhou, Z. Wen, P. Gao *Adv. Energy Mater.* **2018**, 1702512.
[3] P. Quagliotto, A. Fin, *Lett. Org. Chem.* **2018**, *15*, 991-1006.
[4] M. R. Andersson, D. Selse, M. Berggren, H. Jaervinen, T. Hjertberg, O. Inganaes, O. Wennerstroem, J.E. Oesterholm, *Macromolecules* **1994**, *27*, 6503-6506.
[5] A. E. Rudenko, B. C. Thompson, *J. Polym. Sci. Part A: Polym. Chem.* **2015**, *53*, 135-147.
[6] X. Shi, A. Sui, Y. Wang, Y. Li, Y. Geng, F. Wang, *Chem. Commun.* **2015**, *51*, 2138-2140.
[7] R. S. Sprick, M. Hoyos, O. Navarro, M. L. Turner, *React. Funct. Polym.* **2012**, *72*, 337-340.
[8] N. Yaghoobi Nia M. Zendehdel, L. Cina F. Matteocci A. Di Carlo, *J. Mater. Chem. A,* **2018**, *6*, 659-671.