Potential Hole Transport Materials for Perovskite Solar Cell (PSC)

Mrinal K. Das,[a] Sinchan Maji,[b] Pritam Dey,[c] Tanmoy Maiti,[c]* Debaprasad Mandal,[b]* and Alakesh Bisai[a]*

[c]*Department of Material Science and Engineering, IIT Kanpur;* [b]*Department of Chemistry, IIT Ropar;* [a]*Department of Chemistry, IISER Bhopal*

**E-Mail: alakesh@iiserb.ac.in*

Truxene(**1**) is a fluorescent polyaromatic structure that exhibits a poor solubility in most of the common organic solvents in its unsubstituted form.[1] To address this issue, introduction of solubilizing groups have been reported.[1b] In fact, Gratzel and Nazeeruddin*et. al.*revealed that molecularly engineered *aza*-truxene(**2**) exhibit surface interaction with perovskite material resulting efficient hole injection from the valence band of perovskite into the HOMO of Hole Transport Material (HTM).[2]On the basis of the CV measurements, UV−vis, and PL spectra, the HOMO and LUMO energy levels of **2** was found to be in good alignment with the energy levels of perovskite material. Remarkable power conversion efficiency of 17.7% was realized using **2**as HTM and compositiveperovskite as absorber, which is on par with that of spiro-OMeTAD (17.1%).[3]Recently, Jen *et. al.* have reported a strong dipolar D-A (*Donor-Acceptor*) chromophore (**4**) with good hole-transporting ability as an efficient *dopant-free* HTM to realize high performance conventional PSCs, which shows power conversion efficiency of 17%.[4]

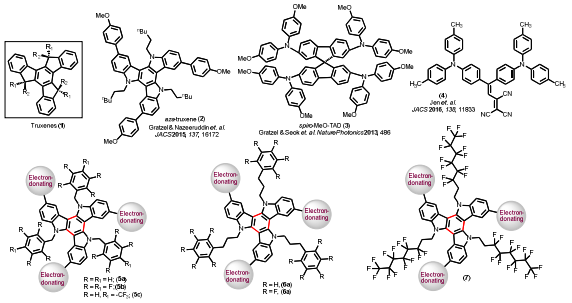

Figure. Potential Hole Transport Materials (HTMs) for Perovskite Solar Cell (PSC).

We hypothesized that*aza*-truxenesanchored with electron-deficient fragments,such as **5-7**, would not only improves interfacial properties and efficiency but also protects from humidity and UV induced degradation of PSCs. Our synthetic endeavours towards the development of two dimensional fluorous*aza*-truxene materials and their spectroscopic behaviorswill be discussed.[5]

References:

1. (a) Marderet. al. *Adv. Mater.* **2011**, *23*, 268. (b) Goubard, F.; Dumur, F. *RSC Adv.* **2015**, *5*, 3521.
2. Nazeeruddin & Gratzel*et. al. J. Am. Chem. Soc.* **2015**, *137*, 16172.
3. Gratzel & Seok*et. al. Nature Photonics* **2013**, 486.
4. Li, Z.; Zhu, Z.; Chuen, C. –C.; Jo, S. B.; Luo, J.; Jang, S.-H.; Jen, A. K.-Y. *J. Am. Chem. Soc.* **2016**, *138*, 11833.
5. (a) Ghosh, S.; Bhunia, S.; Kakde, B. N.; De, S.; Bisai, A. *Chem. Commun.* **2014**, *50*, 2434. (b) Ghosh, S.; Chaudhuri, S.; BisaiA. *Chem. -Eur. J.* **2015**, 21, 17479.