[Poster#30]

Hole-Transporting Spirothioxanthene Derivatives as Donor Materials for Efficient Small-Molecule-Based Organic Photovoltaic Devices

Chin-Yiu Chan,[1] Yi-Chun Wong,[1] Mei-Yee Chan,[1] Sin-Hang Cheung,[2] Shu-Kong So[2] and Vivian Wing-Wah Yam[1]

[1]*Department of Chemistry, The University of Hong Kong, Pokfulam Road, Hong Kong*
[2]*Department of Physics, Hong Kong Baptist University, Kowloon Tong, Hong Kong*
Email: h1092077@hku.hk

Taking the advantages of the 3D structure and rigid spiro-conjugation, spirobifluorene and its derivatives are a benchmark class of p-type semiconductors in organic electronic devices because of their good charge-transporting properties. However, their low absorption coefficients within the visible spectrum render their application as photoactive materials in the fabrication of organic photovoltaic (OPV) devices. A new class of heterocyclic spirothioxanthene derivatives has been designed and synthesized by the functionalization of the spiro core with various triarylamine groups and the modification of the heteroatom of the spiro core. The photophysical, electrochemical and thermal properties of these spirothioxanthene derivatives have been fully characterized. Of particular interest, all of these compounds exhibit high hole mobilities of up to 10–3 cm2V–1s–1, as determined from thin film transistor measurement. More importantly, these spirothioxanthene derivatives are promising donor materials for the fabrication of high performance OPV devices. With a very low dopant concentration of 7 % doped into fullerene matrix, efficient small molecular-based OPV devices with high open-circuit voltage of 0.94 V and high power conversion efficiency of 5.40 % (the highest PCE of 5.46 %) have been realized. This demonstrates for the first time their application studies as photovoltaic donor materials in OPV devices.

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References

[1] Chan C.-Y., Wong Y.-C., Chan M.-Y., Cheung S.-H., So S.-K., Yam V. W.-W., *Chem. Mater*. **2014**, *26*, 6585.