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“High efficiency near-infrared dye sensitized solar cells”

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Dye-sensitized solar cells (DSCs) have received increasing attentions owing to their potential use in low-cost production of renewable energy. Nowadays, the main challenges of researches on organic sensitizers in the field of dye-sensitized solar cells are developing efficient and stable near-infrared (NIR) absorption sensitizers for panchromatic harvesting solar spectrum by itself or co-sensitized with another sensitizer, and ensuring appropriate energy levels for efficient electron injection and regeneration. Squaraine and Boron dipyrromethene (Bodipy) dyes are most promising candidates as the red and NIR sensitizers for DSCs, due to its simple synthetic routes, as well as excellent absorption property and stability. However, among all relative publications, the incident photon-to-current conversion efficiency (IPCE) is still low due to unmatched energy levels (most cases are lower than 50% at 700 nm). Recently, we developed new molecular design strategy by modifying the central moieties of squaraine and Bodipy molecules, therefore, to fine tune the HOMO and LUMO energy levels by modulating the strength of electron-withdrawing and π-conjugation length, as well as to suppress dye aggregation. In this report, I will introduce some our recent progresses and details of developing novel NIR squaraine and Bodipy dyes, and their application on the transparent DSCs.

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