

スクアリリウム誘導体を用いた多色半透明有機薄膜太陽電池

Colorful Squaraines for Efficient Solution-Processed Small Molecule Semitransparent Organic Solar Cells

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Recently, developing semitransparent organic solar cells (ST-OSCs) are considered to become one of the highest priorities in the market of next-generation solar cells, because ST-OSCs enable wearable electronics, solar-powered automotive, power-generating windows, and building integrated photovoltaic as electricity-generating facades, shelters, roofs, and windows.[1] However, the development of ST-OSCs is significantly lagging behind opaque OSCs, particularly in small molecule ST-OSCs. Herein, four unique squaraines (SQ-R2, SQ-BP, D-BDT-SQ, and AzUSQ) are successfully used as donors in ST-OSCs,[2] whose colors can be tuned from red to blue, green, and dark green, respectively, as shown in Figure 1. While using ultrathin Ag as a transparent electrode, the ST-OSCs fabricated using SQ-R2:PC₇₁BM, SQ-BP:PC₇₁BM, D-BDT-SQ:PC₇₁BM, and AzUSQ:PC₇₁BM yield power conversion efficiencies (PCEs) of 1.64%, 4.36%, 4.91%, and 1.71%, respectively, and their colors are purple, cyan, brown, and light brown, respectively. Furthermore, each of these ST-OSCs exhibit good average visible transmittance (AVT) of 25%–30%. This remarkable result indicates that squaraines should be considered as very promising candidates to promote the development of colorful ST-OSCs. Moreover, these colorful squaraines create scope for the development of tandem solar cells and solar sharing for agriculture.

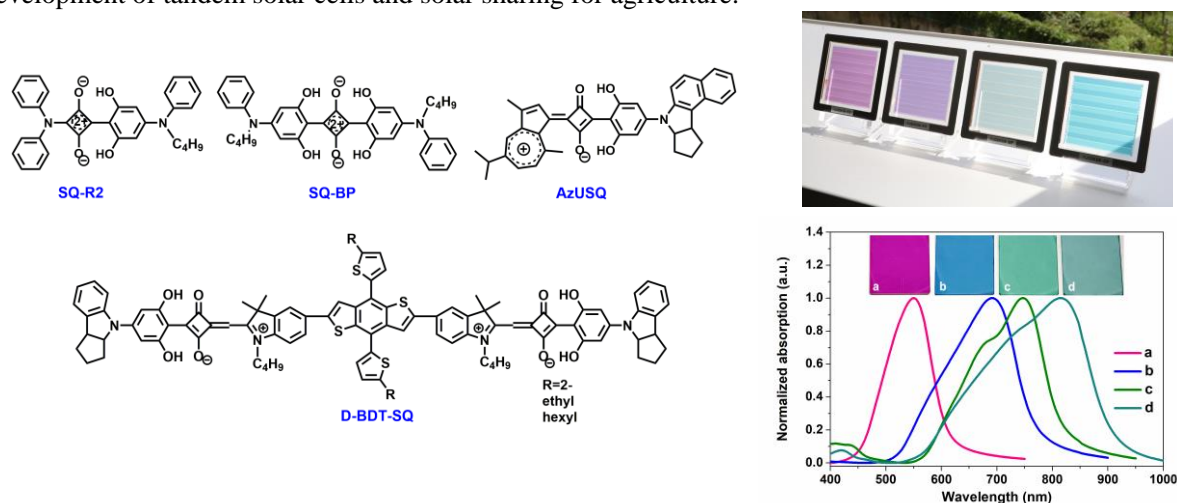


Fig. 1. Chemical structures of the four squaraines (left), and normalized absorption spectra photographs of squaraine films and the colorful semitransparent OPV panels, a) SQ-R2, b) SQ-BP, c) D-BDT-SQ, and d) AzUSQ (right).

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References

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