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Original article

Tailoring the photophysical and photovoltaic properties of boron-difluorodipyrromethene dimers

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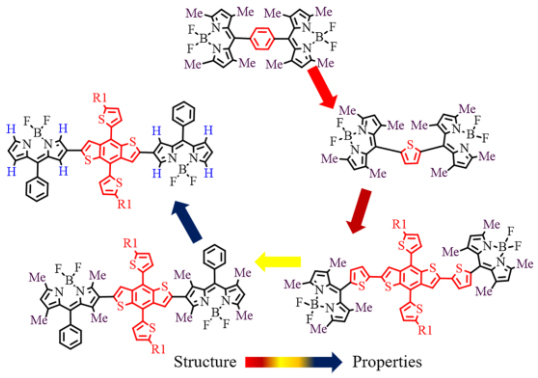
Graphical abstract



The photophysical and photovoltaic properties of BODIPY based dimers can be modulated effectively by facile structural modifications.

ABSTRACT

Five boron-difluorodipyrromethene (BODIPY) dimers have been designed and synthesized successfully via acid-catalysed condensation and Pd-catalysed cross-coupling reactions. The structural modification, including verifying the structures of the π-bridges, altering the positions the bridges link (*meso*- or β- positions), and regulating the molecular planarity, can modulate the photophysical properties and the aggregation behaviors of the five dimers efficiently. Solution-processed organic solar cells were fabricated to evaluate the photovoltaic properties of these molecules further either as acceptors or donors. When using as nonfullerene acceptor and blended with the polymer donor of PTB7, an open-circuit voltaic (V_{oc}) of 1.12 and 1.08 V was achieved from the thiophene and benzodithiophene bridged BODIPY dimers, respectively. This V_{oc} is among the top values achieved from the non-fullerene organic solar cells so far.

Keywords:
BODIPY
Nonfullerene acceptor
Small molecule donor
Photovoltaic cell

Solution-processed