Development of polymer donors and small-molecule acceptors for high-efficiency organic solar cells

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Recently, organic solar cells have made great progress in power conversion efficiency (PCE) via replacing fullerenes organic non-fullerene acceptors (NFAs).
NFAs exhibit strong absorption in the visible area, thus selection of polymeric donors showing complimentary absorption with NFAs realizes the broad-band absorption able to utilize entire visible ray. In addition, the active layer composed of all the organic materials shows the improved thermal stability and mechanical strength compared to fullerene-based solar cells, which gives a bright future in organic solar cells.
Currently, lots of efforts have focused on NFAs, but development of polymeric donors are equally important to achieve the PCE over 15%.
In this talk, we present recent progress on developing polymer donors and small-molecule acceptors for high-efficiency organic solar cells. First, we developed the porphyrin-based organic solar cells showing near infrared absorption and significantly low energy loss, which were achieved by synthesizing both porphyrin donors and acceptors. Second, we developed the polymeric donors showing optimum nano-morphology with small-molecule non-fullerene acceptors.