

Special Issue: Organic Photovoltaic Polymers

Organic photovoltaic devices (OPVs) show promise as the next-generation clean-energy technology with diverse applications, due to their unique merits of low-cost production with solution processability, light-weight, ultra-flexibility, good visible transparency for solar windows, aesthetic with vivid color, etc. Since the discovery of photovoltaic effect by sandwiching the Anthracene with electrodes, the OPVs has drawn more and more attention. In the most recent years, comprehensive research on materials design, interface modification, morphology control, device structure design, etc., leads to the rapid progress in OPV, with break-through power conversion efficiency (PCE) over 20%, and more diverse applications. These achievements further push the OPVs to the edge of commercialization.

To reflect the above rapid development, highlight the main advances, and further spur the development of OPV, we organized this special issue "Organic Photovoltaic Polymers". After careful consideration, we are glad to push 18 invited contributions, including 2 feature articles, 1 mini-review and 15 research articles.

In the review/feature articles, Wang *et al.* overviewed the machine learning method for developing more efficient molecules, which can be an effective tool for molecular design in the future. Ye *et al.* accounted the recent work on blending photo-inactive polymer into the active blend film, and the added values brought by the insulating polymers are summarized, including both mechanical and thermal properties. Sun *et al.* reviewed the development of green-solvent processed all polymer solar cells, from materials design and morphology control perspectives.

In the research articles, Min *et al.* synthesized a novel near-infrared polymer acceptor, that enables over 15% efficient all polymer solar cells. He *et al.* studied the subtle effect of alkyl substituted π -bridges on device performance of OPVs. Li *et al.* developed a series of double-cable conjugated polymers with different fullerene contents for application in single-component OPVs. Duan

et al. designed halogen-free polymer donors based on 3,4-dicyanothiophene for high-performance OPVs, with simplified synthesizing route. Zhan *et al.* investigated effects of thieno[3,2-*b*]thiophene number of narrow-bandgap fused-ring electron acceptors on device performance of OPVs. Chen *et al.* reported a low reorganization energy and two-dimensional acceptor with four end units for OPV with low energy loss. Peng *et al.* synthesized lowly fused non-fullerene acceptors for efficient organic solar cells, as enabled by isomerization. Li *et al.* developed the un-axisymmetric non-fused electron acceptors for efficient OPVs. Cui *et al.* designed nonfused-core-small-molecule-acceptor-based polymer acceptors for all-Polymer solar cells. Zhu *et al.* synthesized planarized polymer acceptor featuring high electron mobility for efficient all-polymer solar cells. Liu *et al.* reported 15% efficiency all-polymer solar cells based on a polymer acceptor containing B←N unit. Bo *et al.* examined the effect of polymer chain regularity on the photovoltaic performance of OPVs. Lin *et al.* reported and revealed the unusual efficiency enhancement of OPVs with polymer-donor-treated cathode contacts. Ma *et al.* reported that the subtle alignment of organic semiconductors at the donor/acceptor heterojunction can facilitate the photoelectric conversion process in OPVs. Yao *et al.* demonstrated 100 cm² OPVs with 23% efficiency under indoor illumination.

The above contributions represent the state-of-the-art in the field of OPVs. Undoubtedly, the aforementioned studies have shed light on the bright future of the research and commercialization of OPVs, and should also have broad impact on the development of organic optoelectronics. Therefore, we hope this special issue will be beneficial for researchers working in this field and other related areas. Especially, we expect that new thoughts and ideas will be continuously stimulated, generated, and presented by researchers from this field. We finally thank all the authors for their valuable contributions as well as the reviewers and editors for their evaluation and editorial work to make this special issue successful.



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