Bifacial Polymers: From Concept to Synthesis, Property and Applications

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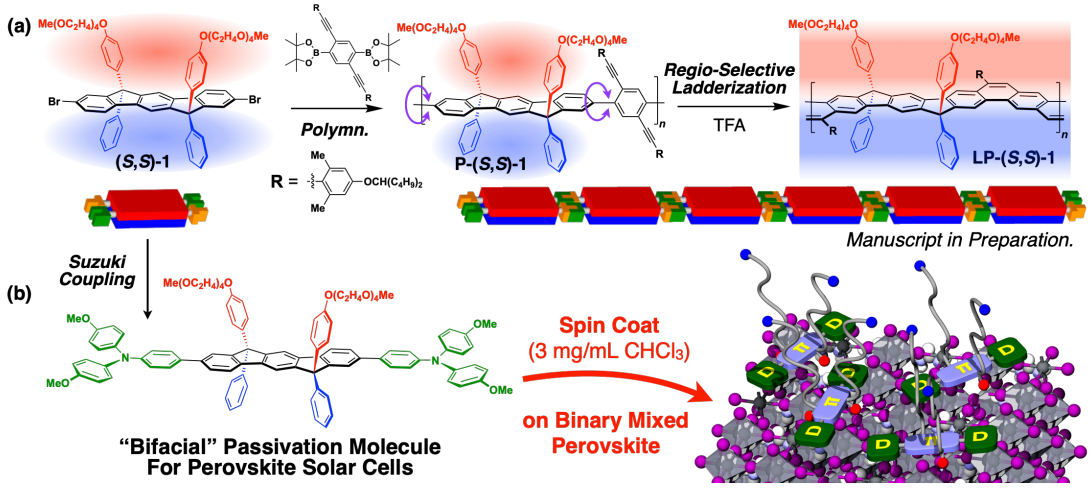
Keywords: *Ladder Polymer, Chiral, Self-Assembly, Perovskite Solar Cell, Circular Polarized Luminescence*

Ladder polymer is an interesting class of polymer having two bonds in their main chains. As an interesting structural feature, the ladder polymers possess the "face" along the main chain due to the two bonds over the entire mainchain. To develop ladder polymers with new structural concept, focusing on the "face" of the ladder polymers, in this work, we designed "bifacial" fully conjugated ladder polymers that have contrasting moieties on each face, which might exhibit particular self-assembling and electronic properties in solution and solid state.

To synthesize the bifacial ladder polymers, we synthesized and polymerized an enantiopure bifacial C_2-chiral indenofluorene monomer (Fig. a) with a regioregular ladder-polymerization technique developed by Ikai and Yashima[1]. Enantiopure monomer (*S*,*S*)-**1** was polymerized with acetylene-appended diboronic ester to give the corresponding polymer P-(*S*,*S*)-**1**. Then, this precursor polymers were regioselectively cyclized by trifuluoroacetic acid[1] to afford the target bifacial fully conjugated ladder polymer LP-(*S*,*S*)-**1** (Fig. a). Furthermore, as an interesting application of bifacial structure, we developed bifacial donor-π-donor passivation molecule (Fig. b) for organic–inorganic lead halide perovskite solar cells (PSCs), and achieved the enhancement of power conversion efficiency and device lifetime.[2] In the presentation, we will detail the synthesis and characterization of the bifacial ladder polymers, their self-assembling and electronic properties, and further scopes for bifacial polymers.



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