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Conjugated Polymer, Polymer Light-emitting Diode, Organic TFT, Polymer Solar Cell

Our laboratories are mainly focused on the synthesis of organic materials for optoelectronic applications including polymer light emitting diode (PLED), organic thin film transistor (OTFT) and organic photovoltaic (OPV). In the synthetic part, we design and synthesize several series of poly (diphenyl-phenylene vinylene) (DP-PPV) derivatives for the application of high luminescent PLED devices. We also synthesize several series of low band gap conjugated polymers based on multicyclic fused ring approach to achieve high performance OTFT and OPV devices. For the device fabrication, we use crosslinkable fullerene derivatives as an interfacial layer in combination with a nano-structured approach to realize a high performance, ordered nano-structured OPV devices. The device exhibits a record power conversion efficiency of 7.3 % (Fig 1). Recently a copolymerization strategy was developed to incorporate porphyrin LHU into a D-A polymer. Proper amount of LHU made the PPor a panchromatic light absorber. The additive-free PPor-2 : $PC_{71}BM$ devices delivered PCE up to 8.6%, and represented a breakthrough in porphyrin-incorporated and 2D conjugated copolymers (Fig. 2).

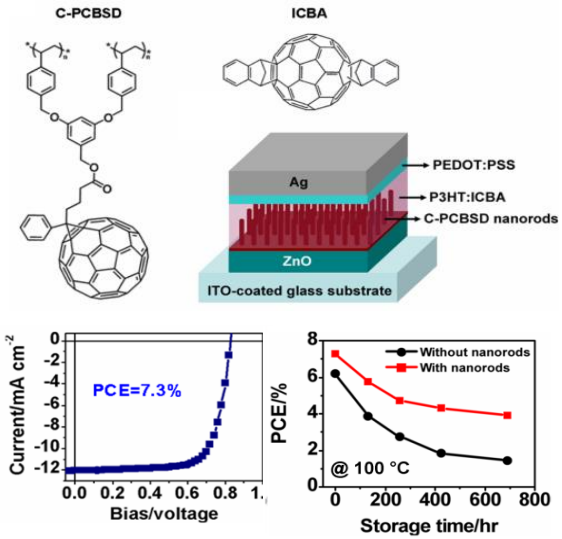
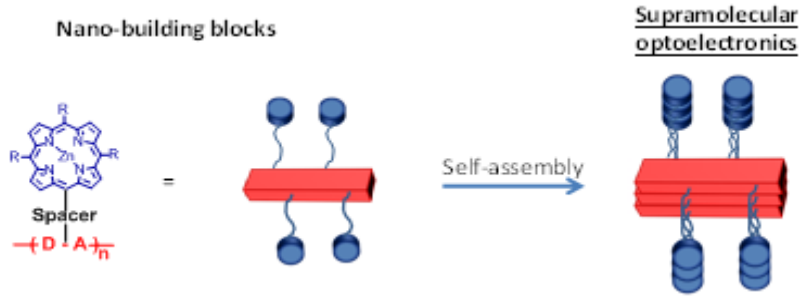


Fig. 1 : Enhanced performance and stability of polymer solar cell by incorporating vertically aligned, cross-linked fullerene nanorods.



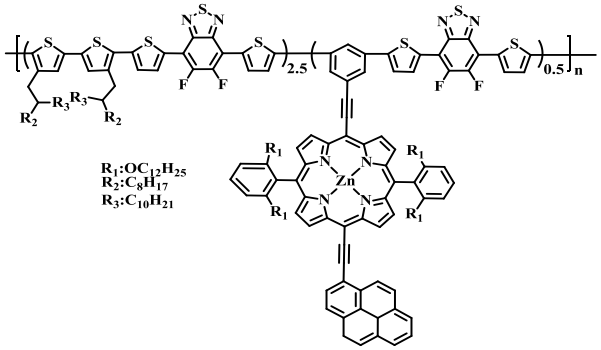


Fig. 2：Chemical structure of porphyrin-incorporated and 2D conjugated copolymers.