Northwestern | CHEMISTRY

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"Synthetic Strategies and Process Development for Flexible Optoelectronics"

Tech LR3

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Abstract

Organic and hybrid organic-inorganic semiconductors have been envisioned for a myriad of optoelectronic and energy applications where mechanical flexibility, light weight, and low-temperature fabrication processes possibly by printing are major advantage over silicon. In this presentation we will describe the design rationale, synthesis, and characterization of several organic semiconducting materials for printed/flexible thin-film transistors (TFTs), circuits, photovoltaic cells (PVs), batteries, and SERS sensors. Furthermore, we aim at understanding their charge-transport/performance characteristics as a function of the semiconductor film processing, device architecture, and device interfacial modifications. Finally, a new approach to tune, via molecular design, the degree of π-conjugation in semiconducting polymers is presented and how it affects charge transport and mechanical flexibility. Our materials enable the realization of printed TFTs with carrier mobilities > 3-40 cm^2/Vs, printed OPV cells with efficiencies >12%, aqueous batteries with specific capacities > 395 mAh g^{-1}, and organic SERS platforms with uncommon enhancements (>10^5).