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Organic-Inorganic Nanocomposites by Placing Conjugated Polymers in Intimate Contact with Quantum Rods ZHIQUN LIN, XINCHANG PANG, LEI ZHAO, Georgia Institute of Technology — Semiconductor organic-inorganic nanocomposites were synthesized by directly grafting conjugated polymer poly(3-hexylthiophene) onto cadmium selenide nanorods surface (i.e., P3HT-CdSe NR nanocomposites). The direct grafting was accomplished by two simple yet robust coupling reactions: Heck coupling of vinyl-terminated P3HT with bromobenzylphosphonic acid functionalized CdSe NRs (i.e., BBPA-CdSe), and a newly developed catalyst-free click reaction of ethynyl-terminated P3HT with azide functionalized CdSe NRs. Such rationally designed nanocomposites possessed a well-defined interface between P3HT and CdSe NRs, thereby promoting the effective dispersion of CdSe NRs within the nanocomposites and facilitating their electronic interaction. The success of grafting was confirmed by nuclear magnetic resonance spectroscopy and dynamic light scattering. The occurrence of charge transfer at the P3HT/CdSe interface was evidenced by UV-Vis absorption, photoluminescence (PL), and time-resolved PL studies. Notably, the nanocomposites prepared by the catalyst-free click reaction exhibited a faster charge transfer from P3HT to CdSe. These nanocomposites offer a maximum interfacial area between the constituents for efficient exciton dissociation. As such, it represents a significant advance in rational design and fabrication of organic-inorganic hybrid solar cells with improved power conversion efficiency.

Zhiqun Lin
Georgia Institute of Technology

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