

ULTRAFAST TRANSIENT ABSORPTION SPECTROSCOPY INVESTIGATION OF PHOTOINDUCED DYNAMICS IN NOVEL DONOR-ACCEPTOR CORE-SHELL NANOSTRUCTURES FOR ORGANIC PHOTOVOLTAICS

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Novel donor-acceptor nanostructures were synthesized via covalent synthesis and/or UV cross-linking method. Their photoinduced dynamics were investigated with ultrafast transient absorption (TA) spectroscopy. These new nanostructures are made with the strategy in mind to reduce manufacturing steps in the process of fabricating an organic photovoltaic cell. By imitating the heterojunction interface within a fixed particle domain, several fabrication steps can be bypassed reducing cost and giving more applicability to other film deposition methods. Such applications include aerosol deposition and ink-jet printing. The systems that were studied by TA spectroscopy include PDIB core, PDIB-P3HT core-shell, and PDIB-PANT core-shell which range in size from 60 to 130 nm. Within the experimentally accessible spectra range there resides a region of ground state bleaching, stimulated emission, and excited-state absorption of both neutrals and anions. Control experiments have been carried out to assign these features. At high pump fluences the TA spectra of PDIB core alone also indicate an intramolecular charge separation. The TA spectroscopy results thus far suggest that the core-shells resemble the photoinduced dynamics of a standard film although the particles are dispersed in solution, which indicates the desired outcome of the work.