

Abstract Submitted
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Measuring and Modeling Exciton Dynamics in Multichromophore Macromolecules DANIEL WEINGARTEN, NAN HU, Univ of Colorado - Boulder, MICHAEL LACOUNT, Colorado School of Mines, ANDREW FERGUSON, National Renewable Energy Laboratory, DANIEL DESSAU, DAVID WALBA, Univ of Colorado - Boulder, JAO VANDELAGEAAT, National Renewable Energy Laboratory, MARK LUSK, Colorado School of Mines, GARRY RUMBLES, National Renewable Energy Laboratory, SEAN SHAHEEN, Univ of Colorado - Boulder — Attaining specific control over the dynamics of exciton movement in organic photovoltaics (OPV) has, thus far, been a largely unachieved goal of OPV design. Such an understanding of exciton transfer dynamics would allow for the design of macromolecules whose energetics, bandgaps, and conformational properties allow for control of exciton flow toward specific reaction site chromophores, potentially enabling non-linear improvements in energy harvesting. To better understand exciton movement we synthesized and characterized a multi-chromophoric macromolecule and measured the dynamics of exciton transfer across coupled chromophores. Our model system is a hexabenzocoronene molecule attached to six oligothiophene. We developed a kinetic model and by fitting it to the decay rates of excited states measured via time-correlated single photon counting, we were able to extract rates for exciton transfer between chromophores. Since this macromolecule exhibits liquid crystalline aggregation behavior, observing the dependence of exciton transfer rates on solution concentration yields an improved understanding of exciton movement within a single molecule as well as the dependence of that transfer process on local material structure.

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