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SEMINAR SERIES

The Center for Excitonics is an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science and Office of Basic Energy Sciences

Harnessing Spin, Delocalisation and Coherence in Molecular Semiconductors

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Abstract: For more than three decades the electronic properties of molecular semiconductors have been described as ‘limited by disorder’. Thus, attempts to improve their performance have mainly focused on materials properties such as improving crystallinity and charge mobility. But recent results suggest that some of the most interesting and technologically relevant properties of these systems emerge from the interplay of spin, delocalisalised electronic states, coherent charge motion and vibrational coherence. In this talk I will discuss how these ‘disordered’ materials can harness these phenomena to enable 100% efficient photon to electron conversion in photovoltaics [1-3] and 200% efficient conversion of spin-singlet excitons to spin-triplet excitons via singlet excitons fission. I will also discuss all optical methods to couple singlet fission with conventional inorganic semiconductors [4], with an aim of overcoming thermalisation losses in photovoltaics, and the unique spin properties of helical molecular systems.

Tues Nov 3, 2014
Room 4-237
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