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ENHANCED OPTICAL EFFECTS FROM EXCITONS IN MULTI-CHROMOPHORE SYSTEMS

Ted Goodson
University of Michigan

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***Abstract*:** Organic conjugated macromolecules have received great attention due to their use in optical and electronic applications. Certain molecular assemblies have shown enhanced light harvesting properties by virtue of strong excitonic coupling in the multi-chromophore system. Organic dendrimers, two-dimensional networks, and circular macromolecular aggregates have shown properties of strong intra-molecular interactions which have been utilized in light harvesting processes, photovoltaic (solar) devices, dielectric effects, as well as for enhanced nonlinear optical effects. This talk will discuss our basic results and conclusions over the past years utilizing these systems. The excitation mechanism in these systems depends on the nature of the branching center, the geometrical orientation of covalently attached chromophores, and the extent of delocalization. Through steady-state and time-resolved spectroscopy, we have characterized the mechanism of energy transport and the relative strength of intra-molecular interactions. In this presentation the photo-physical properties and applications in optical and electronic devices will be described. For particular assemblies the processes of efficient energy transfer, fast energy redistribution, and enhanced two-photon absorption cross-sections will be discussed.

Bio Theodore Goodson III received his B. A. in 1991 from Wabash College and earned his Ph.D. in Chemistry at the University of Nebraska-Lincoln in 1996. After postdoctoral positions at the University of Chicago and at the University of Oxford, he accepted a position as Assistant Professor of Chemistry at Wayne State University in 1998. In 2004 he moved to the University of Michigan as Professor of Chemistry. In 2008 he was appointed as the Richard Barry Bernstein Professor of Chemistry at the University of Michigan. Dr. Goodson's research centers on the investigation of nonlinear optical and energy transfer in organic multi-chromophore systems for particular optical and electronic applications. His research has been translated into technology in the areas of two-photon organic materials for eye and sensor protection, large dielectric and energy storage effects in organic macromolecular materials, and the detection of energetic (explosive) devices by nonlinear optical methods. He has investigated new quantum optical effects in organic systems which have applications in discrete communication systems and sensing.

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