Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Excitonic Properties of Novel π-conjugated Polymers for Organic Electronics EVAN LAFALCE, XIAOMEI JIANG, University of South Florida, CHENG ZHANG, South Dakota State University — We compare the photophysics of different derivatives of the π-conjugated polymer Poly(thienylenevinylene) (PTV) by photoluminescence (PL) and electro-absorption (EA) spectroscopy. The binding energy of the primary excitonic excited state is obtained from EA and is found to be related to the quantum efficiency for PL. In particular, both quantities are determined by the energies of the first optically allowed state and the first optically forbidden state above the ground state. In most PTV derivatives, the optically forbidden state lies below the optically allowed state and the PL is efficiently quenched by internal conversion. When the order of excited states is reversed, PL is observable with an efficiency that scales with the binding energy of the exciton as determined by EA. Thus, the chemical structure governs the interplay between π-conjugation delocalization and electron correlation that determines the ordering of excitonic states. This ordering then in turn dictates the effectiveness of a π-conjugated polymer for both emission and exciton dissociation and therefore dictates a material's suitability for either Organic Light-emitting Diodes or Organic Photovoltaic devices. This information then may be useful in the design of novel materials for application in these devices.

Evan Lafalce
University of South Florida

Date submitted: 09 Nov 2012

Electronic form version 1.4