SYTNTHESIS AND CHARACTERIZATION OF NON-CONJUGATED POLYMERS FOR ORGANIC PHOTOVOLTAICS

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Abstract

While diligent efforts are being undertaken to improve the efficiency and stability of organic photovoltaic devices made from polythiophenes blended with fullerene-derivatives, the field may benefit from an infusion of new candidate photoactive materials. Solar cell devices incorporating Perylene diimide structures have demonstrated photovoltaic performance in the past, while retaining remarkable air stability and very low cost, although the efficiency has been low. To research and develop these candidate materials further, novel perylene diimide based molecular and polymer systems have been synthesized and their structural, photophysical, and (photo)electrical properties are being investigated by a number of techniques including NMR, Mass Spectrometry, GPC, MALDI, and ESI. The HOMO-LUMO band edge positions are estimated using cyclic voltammetry, Ultraviolet Photoelectron Spectroscopy (UPS), Absorbance, and Emission. The charge carrier mobilities are obtained via time-of-flight measurements. Exciton diffusion lengths are measured via fluorescence quenching studies. The fundamental properties of the synthesized non-conjugated perylene polymers will be compared to typical π-conjugated polythiophene polymers such as P3HT.