

Plastic Solar Cells: Self-Assembly of Bulk Heterojunction Nano-materials by Spontaneous Phase Separation

Abstract:

I will describe the discovery of ultrafast photoinduced electron transfer as the scientific foundation for the creation of a technology for low cost “plastic” solar cells. This initial charge separation occurs at a time scale two orders of magnitude faster than the first step in photo-synthesis in green plants. Charge collection at the electrodes is accomplished through self-assembly of bulk heterojunction (BHJ) nano-materials by spontaneous phase separation.

I will focus on the details of the operating mechanism; the origin of the open circuit voltage (V_{oc}), the role of morphology on the charge separation and charge collection at the electrodes, the need for charge selective buffer layers and the origin of the limitations on the fill factor (FF). I will focus on our recent studies of the competition between sweep-out and recombination and on studies of recombination mechanisms in BHJ solar cells.