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**Advances in Polymer-Fullerene Photovoltaic Devices**

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Polymer solar cells are of high interest due to their potential as efficient, lightweight, large area, flexible renewable energy sources. The basic mechanism for the photovoltaic effect in polymers consists of transfer of a photoexcited electron from the polymer donor to a fullerene electron acceptor followed by transport of the electron and hole through the acceptor and donor,, respectively, to the opposite electrodes. Polymer photovoltaic efficiencies can be increased by utilizing improved materials as electron donors and acceptors as well as by controlling the nanoscale morphology of the thin film devices. The highest efficiencies ($\sim$7%) obtained thus far utilize a nanoscale polymer-fullerene blend referred to as a bulk heterojunction, which undergoes phase separation on the 10 nm length scale in order to facilitate charge transfer from the photoexcited polymer to the fullerene electron acceptor. More organized geometries that maximize the majority carrier materials at the respective electrodes could lead to enhanced efficiencies. In one approach, thermal interdiffusion of an initial bilayer of the donor and acceptor materials can be employed to create a concentration gradient in order to optimize both the charge transfer and charge transport processes. This presentation will overview the state-of-the-art in polymeric solar cells and describe the development of thermally-interdiffused concentration gradient geometries as an alternative route towards increased efficiencies.