Abstract of Presentation

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Charge transport and recombination in bulk-heterojunction solar cells

Abstract :

In this work we clarify the difference in charge transport and recombination in bulk-heterojunction solar cells fabricated from a 1:2 mixture of regioregular poly(3-hexylthiophene) (RRPHT) and 1-(3-methoxycarbonyl)propyl- 1-phenyl-[6,6]-methano- fullerene (PCBM). We have used a multitude of experimental techniques such as Time-of-Flight (TOF), Double Injection (DoI) and Charge Extraction by Linearly Increasing Voltage (CELIV) techniques to measure charge carrier transport and recombination [1].

We found that the charge carrier bimolecular recombination is present at very high carrier densities. However, in good solar cells the bimolecular recombination was found to be strongly reduced compared to Langevin-type recombination accompanied with electric field-independent quantum efficiency for charge generation [2]. In low-efficiency samples the recombination of charge carriers is close to Langevin-type with electric field-dependent quantum efficiency as a result. The charge carrier mobilities for both electrons and holes as a function of applied external electric field are measured and the results are presented for both types of solar cells.

We will discuss the implications for the synthesis of new materials for photovoltaic applications.

References:

1. *Review:* A. Pivrikas, G. Juška, K. Arlauskas, M. Scharber, N.S. Sariciftci, and R. Österbacka, "Charge Transport and Recombination Polymer/Fullerene Organic solar cells", Progress in Photovoltaics **15**, 677-696 (2007).

2. A. Pivrikas, G. Juška, A.J. Mozer, M. Scharber, K. Arlauskas, N.S. Sariciftci, H. Stubb, and R. Österbacka, "Bimolecular recombination coefficient as a sensitive testing parameter for low-mobility solar-cell materials", Physical Review Letters, **94** 176806 (2005).