



E-MRS 2011 Spring Meeting

Bilateral Energy Conference
Acropolis Congress Center
Nice, France

May 9 – 13, 2011



ICAM



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Spring 11 S: Organic Photovoltaics: Science and Technology (OPV)

The symposium OPV aims at focusing upon photovoltaic approaches based on organic photoactive materials, namely conjugated polymers, evaporated small molecules or solution processed small molecules. It will cover all aspects of the field, from the synthesis of new materials, to the optimization of the devices and the mass manufacturing of modules.

The growing demand of sustainable sources of energy and the increasing interest in organic electronics have triggered a huge attention to photovoltaic (PV) devices based on organic molecules (OPV). Potentially cheap and easy to process, this type of solar cells offers new opportunities of application and thereby is likely to enlarge the usage of the solar energy in our global balance.

The last year have seen an impressive acceleration of the entire OPV field. Efficiencies above 6 % have been demonstrated in several laboratories, and mass production has been started. However, whether they call upon entirely organic photoactive materials or organic/inorganic hybrid mixtures, OPVs still show lower efficiency and shorter lifetime compared to their fully inorganic counterparts. Thus, located at the cross point of several specific sciences like chemistry, physical chemistry, and physics, OPVs are the object of a steadily increasing number of investigations, carried out by academic as well as industrial scientists.

Since 2003, the E-MRS spring meeting has been hosting the Symposium entitled "Advanced Materials and concepts for Photovoltaics (AMPS)" every two years. The contribution of OPVs in this AMPS symposium has been steadily growing, and reached about 40 % of the total number of abstracts submitted in 2007. In the 2009 Spring Meeting, a new symposium was created, addressing exclusively Organic and Dye Sensitized Solar Cells. This symposium turned out to be the largest of the whole conference, gathering more than 320 abstracts. This success did not only confirm the large demand for such a dedicated symposium. But it did as well confirm the E-MRS Spring meeting (odd years) as being the largest European platform for the Organic Solar Cells community, competing in size with symposia organized overseas (MRS, SPIE).

The goal of the 2011 OPV symposium is to offer a platform of discussion to OPV specialists coming from all over the world. It will cover the topics of bulk-heterojunctions based on conjugated polymers, fullerenes, evaporated or solutions processed small molecules, and organic/inorganic blends. It will consist of oral contributions and poster sessions presenting new materials, architectures, understandings and breakthrough results. Of special interest will be the organization of joint session with other symposia dealing with photovoltaics in order to bring together scientist from various fields, and trigger new collaborations.

16:30

MULTISCALE STUDY OF THE INFLUENCE OF THE CHEMICAL STRUCTURE ON EXCITON DYNAMICS IN POLYMERIC SYSTEMS

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Resume : One of the milestones in the photovoltaic field was the use of a bulk-heterojunction made of polymer/low weight molecules to increase organic solar cells efficiency. When an exciton is created in the polymer, it can easily be dissociated into an electron/hole pair if the exciton reaches the polymer/low weight molecule interface. For that happens, it is necessary an efficient exciton diffusion towards the interface before it decays. This process depends on the polymer used, since it will affect the exciton dynamics, as it is suggested from the experiments. However, there is not a clear relationship between the polymer chemical structure and the exciton dynamics. In this communication we present a study of the influence of polymer molecular properties on exciton dynamics using a multiscale model. We use quantum molecular dynamic calculations to understand the effect of polymer molecular properties on singlet exciton formation in polymeric systems, since they are the main excited species produced in polymer-based solar cells. The results obtained on the atomistic calculations were used as input parameters in dynamic Monte Carlo simulations to study the singlet exciton dynamics in polymeric systems with different chemical structures. Our results show clearly that the polymer chemical structure influences not only the intramolecular singlet exciton energy but also it will influence the exciton diffusion process in the polymer network.

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