Elementary processes in organic photovoltaics

This volume presents the results of a multi-year research programme funded by the Deutsche Forschungsgemeinschaft (German Research Council), which explains how organic solar cells work. In this new promising photovoltaic technology, carbon-based m...

The power conversion efficiencies (PCE) of organic solar cells (OSCs) have been enhanced to > 19%, due to the creative developments of wide-bandgap polymer donors and non-fullerene small-molecule acceptors (NFAs), and device structures [1,2,3,4,5].The photovoltaic performances of OSCs are determined by exciton dissociation (ED) and free charge ...

Elementary Processes in Organic Photovoltaics. Chapter. Donor-Acceptor Dyes for Organic Photovoltaics. Chapter; First Online: 21 December 2016; pp 193-214; Cite this chapter; Download book PDF. Download book EPUB. ... Although organic solar cells (OSCs) are a relatively novel technology, they hold the promise of a substantial price ...

But low power efficiency (about 5 percent research cell efficiency) and open questions like long-term stability of organic solar cells are still limiting a broad application. In order to fulfil the complex requirements of broad application, such fundamental questions and the elementary processes of organic photovoltaic need to be investigated.

Organic Photovoltaics also analyzes in detail the charge-transfer processes in the bulk-heterojunction devices corresponding to the relevant mechanism of carrier generation. Emphasized throughout is the concept of interpenetrating polymer-fullerene networks, due to their high potential for improving power efficiency.

Ultrafast photochemical reactions in liquids occur on similar or shorter time scales compared to the equilibration of the optically populated excited state. This equilibration involves the relaxation of intramolecular and/or solvent modes. As a consequence, the reaction dynamics are no longer exponential, cannot be quantified by rate constants, and may depend on the ...

Quantum Dynamics of Elementary Processes in Organic Photovoltaics I. Burghardt,+ R. Binder,+ J. Wahl,+ H. Tamura+ +Institute for Physical and Theoretical Chemistry, Goethe University Frankfurt, Germany +Advanced Institute for Materials Research, University of Tohoku, Sendai, Japan Laboratory for Chemistry of Novel Materials, Universit e de Mons

Despite these advantages, efficiencies obtained with hybrid polymer / nanoparticle solar cells are still below those of state-of-the-art polymer / fullerene solar cells. This Perspective summarises the achievements in the field of hybrid solar cells, compares the knowledge on elementary processes in hybrid and organic systems and points out ...

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From the contents: Polymeric solar cells: Molecular orientation, structure, and optoelectronic performance.- An integrated approach towards highly efficient bulk-heterojunction solar cells based on dendritic oligothiophenes.- Organic solar cells based on oligothiophene derivatives.- Charge separation at nanostructured molecular donoracceptor interfaces.- p-B-n organic ...

organic solar cells (OSCs) have come from largely trial-and-error-based optimi-zations of the morphology of the active layers. Further improvements, however, ... fullerene BHJ architecture with the basic electronic processes described in the legend [3] (the chemical structures of the donor and acceptor materials mentioned in this review are

Organic photovoltaics (OPV) describes a group of technologies wherein the active layer of a solar cell is composed of hydrocarbon-based organic materials [1-3].OPV occupies a special niche among solar energy technologies in that it could potentially satisfy the growing energy needs of the world with a product that is sustainable, elementally abundant, and ...

Organic and Hybrid Solar Cells Based on. Well-Defined Organic Semiconductors and. Morphologies. Amaresh Mishra, Volker Schmidt, René A. J. Janssen, Peter Bäuerle Pages 25-49. Dicyanovinylene-Substituted. Oligothiophenes for Organic Solar Cells. Christian Koerner, Hannah Ziehlke, Roland Fitzner, Moritz Riede, Amaresh Mishra, Peter Bäuerle et ...

Non-fullerene acceptors have boosted the development of organic photovoltaics. This Review highlights the photophysics and device physics of non-fullerene organic photovoltaics, including exciton ...

In the first very promising solar cell application, a butyl-substituted quinquethiophene was deployed in SMOSC devices, yielding a PCE of 3.4 %[].Meanwhile, the extensive exploration of this material class in synthesis and characterization led to excellent certified PCE values of 8.3 % in single-junction and 9.7 % in multijunction cells using a ...

The investigation of organic solar cells is an interdisciplinary topic, covering physics, chemistry and engineering. The different chapters address topics ranging from the synthesis of new organic materials, to the characterization of the elementary processes such as exciton transport and separation, and the principles of highly efficient ...

Only limited data are available on the stability of organic solar cells [76, 77]. Hauch et al. reported on the stability of flexible organic solar cells, which were packaged with a low-cost and rather high water vapour transmission rate (WVTR) food-packaging barrier before exposing to 1 sun illumination at a temperature of 65 °C.

The different chapters address topics ranging from the synthesis of new organic materials, to the characterization of the elementary processes such as exciton transport and separation, and ...

elementary steps: creation of electron-hole pairs (excitons) exciton dissociation at donor-acceptor junctions (here, PCBM-P3HT)1 capture of charge carriers at electrodes potentially competing ...

For example: in ITIC neat films, calculations relevant to the electron-transport process confirm that face-on configurations lead to larger couplings, which results in higher electron mobility ... Organic solar cells based on non-fullerene small-molecule acceptors: impact of substituent position. Matter, 2 (2020), pp. 119-135.

The photovoltaic performance of non-fullerene organic solar cells (OSCs) is essentially determined by the presence of charge traps. However, their exact distributions in ...

Molecular doping is routinely used in organic semiconductor devices nowadays, but the physics at play remains unclarified. Tietze et al. describe it as a two-step process and show it costs little ...

Semitransparent organic photovoltaics (STOPVs) have attracted broad attention from both academia and industry owing to their potential for low-cost, sustainable, and integrated energy harvesting. This work quantitatively analyzes the current loss and charge recombination processes using capacitance spectroscopy. The surface-trap-assisted recombination is found ...

The active layer of solar cells contains the donor organic material and the acceptor organic material, used in a layer-by-layer fashion in bilayer heterojunction and are combined together in bulk heterojunction solar cells [30]. Light crosses from the transparent electrode followed by the hole transport layer to incorporate into the active layer.

The different chapters address topics ranging from the synthesis of new organic materials, to the characterization of the elementary processes such as exciton transport and separation, and the principles of highly efficient device design.

The parameters in the equation above are exhibited in Fig. 5.4.The value of PCE is calculated from three parameters: short-circuit current density (J SC), open-circuit voltage (V OC), and fill factor (FF).P m stands for the maximum power point, and P in is the incident light power. J SC is the current density of devices when there is 0 V of applied bias on the two electrodes.

Elementary Processes in Organic Photovoltaics (Advances in Polymer Science, 272) [Leo, Karl] on Amazon . *FREE* shipping on qualifying offers. Elementary Processes in Organic Photovoltaics (Advances in Polymer Science, 272) ... The investigation of organic solar cells is an interdisciplinary topic, covering physics, chemistry and engineering ...

Elementary Processes in Organic Photovoltaics [electronic resource] Responsibility edited by Karl Leo. Digital text file; PDF Publication Cham : Springer International Publishing : Imprint: Springer, 2017. Physical

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