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Organic Photovoltaics XII

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This volume includes papers presented at SPIE conference 8116 “Organic Photovoltaics XII,” San Diego, California, August 2011. It includes additional papers relevant to these topics that were not presented at the conference. Papers were peer reviewed and published as special sections of the *Journal of Photonics for Energy*. These journal articles reflect the work and thoughts of the authors. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

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S. Kim et al., "Efficient organic solar cells based on spray-patterned single wall carbon nanotube electrodes," *J. Photon. Energy* **2**, 021010 (2012).

Organic Photovoltaics

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Guest Editorial: Special Section on Organic Photovoltaics

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Organic photovoltaics (OPVs) have a long history, stretching back three decades into the 1980s, when first studies were conducted on the photogeneration of charge carriers at interfaces in organic solids. Compared to inorganic photovoltaics, OPVs offer many advantages, such as low cost, high throughput production, flexible devices, lightweight products, as well as custom-designed colors. In the last decade, research activities have intensified to increase the power conversion efficiencies and lifetimes of OPVs and make them more competitive with their inorganic counterparts.

Scientists and engineers worldwide have worked hard to exploit the inherent advantages of organic materials. A series of breakthroughs in materials, processing, and characterization have been reported in the last couple of years, leading to dramatic gains in the performance of organic solar cells. The most recent certified power conversion efficiencies meet or exceed the 10% level for a solution-processable single-junction device, positioning OPVs as the next-generation solar cells. Companies such as Merck, BASF, Sumitomo, and Plextronics have started to commercialize organic semiconducting materials, while companies such as Konarka Technologies, Heliatek, Solarmer, and Mitsubishi have begun commercialization of organic solar modules.

Further development is necessary in order to achieve OPVs with higher efficiencies and better lifetimes. There are demands for stable and low-band-gap semiconductors with excellent charge-carrier-transport properties; concepts to control the microstructure in bulk heterojunction composites are essential; the development of efficient and environmentally stable interface materials has to take place; and, finally, strategies for a cost-efficient and long-time stable packaging processes need to be developed. In addition, further fundamental understanding of the photophysical processes, including the different interfaces in organic solar cells, is essential to minimize energetic losses and combat device degradation. For the final product release, light propagation and light management need to become integrated in organic solar modules.

In this special section of the *Journal of Photonics for Energy*, papers that address the above issues and challenges are presented. These papers are based partially on talks and posters given at the conference on Organic Photovoltaics XII at the SPIE Optics + Photonics meeting held in San Diego in August 2011. We believe that the readers will find the results of the studies discussed in these manuscripts interesting, educational, and stimulating, and we welcome any constructive feedback with regard to this special section.

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