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ABSTRACTS

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Light-matter interaction in electrospun nanofibers: novel conjugated polymer-based one-dimensional nanostructures for organic solar cell applications

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Single-material organic solar cells (SMOCs) based on fullerene-grafted polythiophenes are considered promising devices for organic solar cells (OSCs). The main efforts in this field focus on the chemical tailoring of polymer molecules to reduce the side effects of charge recombination. These advances have made it possible to obtain a power conversion efficiency (PCE) close to conventional bulk heterojunction (BHJ) cells. So far, however, SMOCs still show inadequate efficiencies due to ineffective charge transport.

Here we show how SMOC efficiency can be strongly increased by optimizing the supramolecular and nanoscale structure of the active layer, while achieving the highest reported efficiency value (PCE = 5.58%) [1]. The enhanced performance may be attributed to well-packed and properly oriented polymer chains. The hierarchical structure is given by the incorporation of electrospun one-dimensional nanostructures obtained from polymer chain stretching. Our results suggest that the active material optimization obtained by the use of electrospun nanofibers plays a key role in the development of efficient SMOCs.

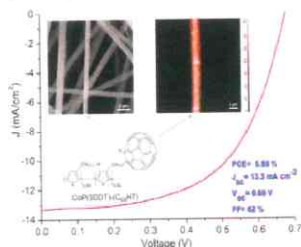


Figure 1: photovoltaic properties and structure of an SMOC based on electrospun nanofibers.

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References

[1] F. Pierini, M. Lanzi, P. Nakielski, S. Pawłowska, O. Urbanek, K. Zembrzycki, and T. A. Kowalewski. "Single-Material Organic Solar Cells Based on Electrospun Fullerene-Grafted Polythiophene Nanofibers". *Macromolecules*, (50): 4972–4981, 2017.