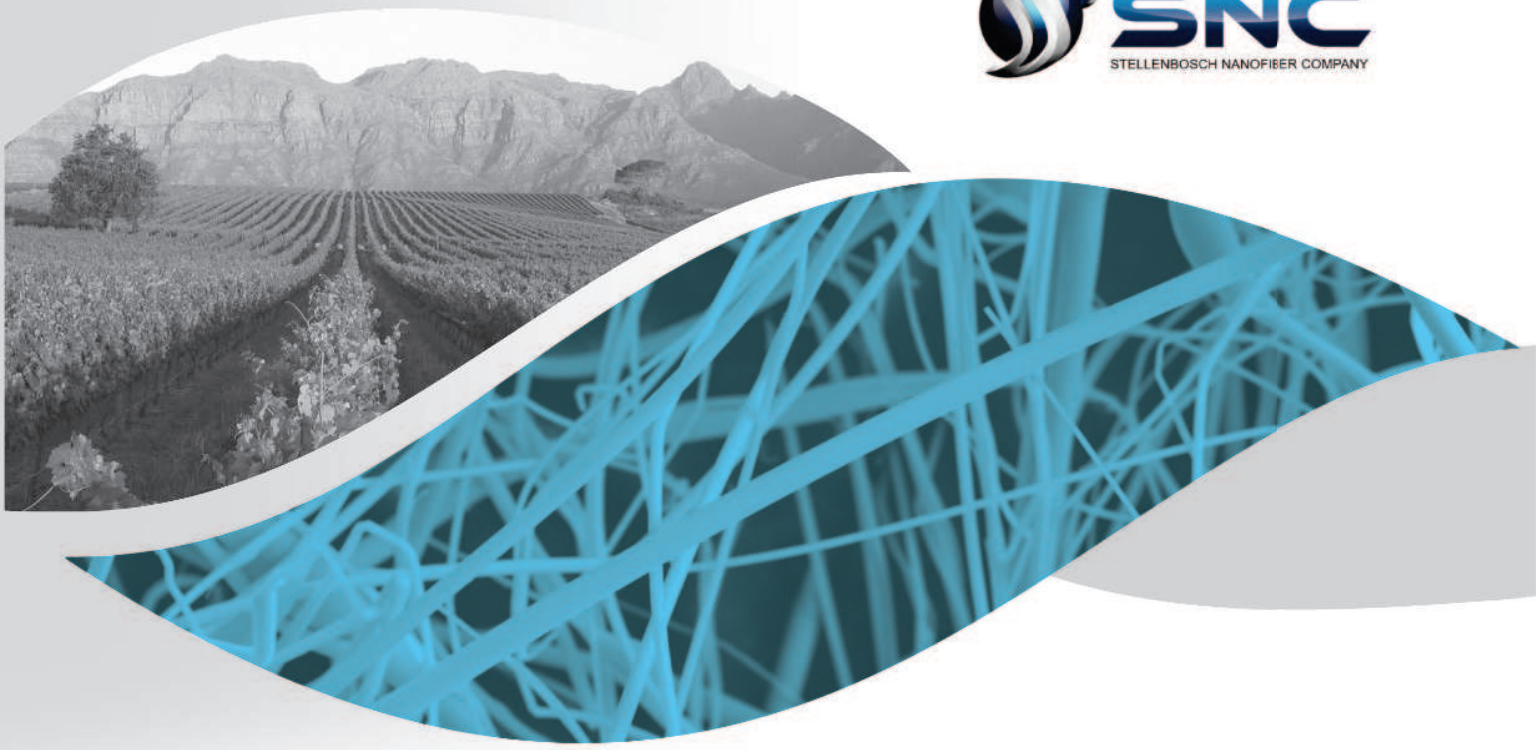

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ELECTROSPINNING OF POLYTHIOPHENE WITH PENDANT FULLERENE NANOFIBERS FOR SINGLE-MATERIAL ORGANIC SOLAR CELLS

F. Pierini[1], M. Lanzi[2], P. Nakielski[1], S. Pawlowska[1], O. Urbanek[1] and T.A. Kowalewski[1]

[1] Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland
[2] Department of Industrial Chemistry "Toso Montanari", University of Bologna, Bologna, Italy

Organic photovoltaics have been attracting great attention due to their remarkable properties of low cost, flexibility and lightweight. Bulk heterojunction (BHJ) devices are the most investigated organic solar cells (OSCs). BHJ cell applicability is severely affected by their active material intrinsic properties which are based on thermodynamically unstable blends. OSCs based on single-component active materials have been developed to avoid the challenging optimization of BHJ cells. Single-material organic solar cells (SMOCs) are based on polymers in which the covalent linking of electron accepting moieties to a hole-transporting conjugated polymer allows intramolecular electron transfer from donors to acceptors. SMOC efficiency is affected by the charge recombination and randomly-directed transport in their structures composed by randomly oriented polymer chains. Electrospinning is the most efficient technique to elongate and align polymer chains to form nanofibers [1], therefore we studied the effect of the electrospun fibers inclusion on the active material structure and cell performance. Here we describe the development of an electrospun nanofiber-based single-material organic solar cell (Figure 1) with high power conversion efficiency (PCE= 5.58%).

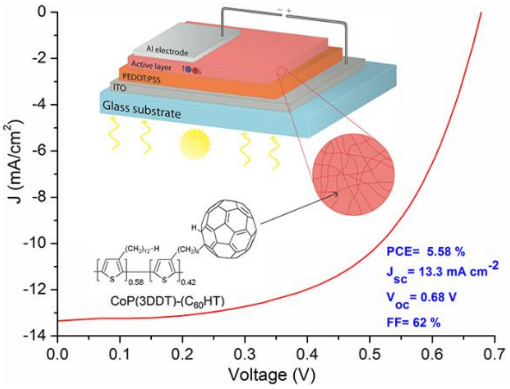

Figure 1: structure and photovoltaic properties of an electrospun nanofiber-based SMOC [2].

We report on the synthesis of a new donor−acceptor double-cable conjugated copolymer, the fabrication of electrospun CoP(3DDT)-(C_{60}HT) nanofibers and their integration into SMOCs. The inclusion of electrospun nanofibers led to a great improvement of the photovoltaic cell performance (+33.2% and +57.2% in terms of efficiency if compared with the best reported SMOC and a conventional bulk heterojunction device, respectively). Finally, detailed polymer, nanofibers and device hierarchical structure characterizations as well as an exhaustive discussion of the mechanism driving the improvement in single-material organic solar cell development by the presence of electrospun nanofibers will be shown. Our results suggest that the active material structure optimization obtained by the application of electrospun nanofibers plays a pivotal role in the development of efficient SMOCs and open and alternative and compelling way to increase organic solar cell performance and applicability [2].

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References

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[2] F.Pierini et al. *Macromolecules* **2017**, 50, 4972−4981.