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Highly Efficient Porphyrin-Based Bulk Heterojunction Organic Photovoltaics

Solution-processed organic solar cells (OSC) are a topic of current scientific interest as a complementary photovoltaic technology to current silicon solar cells owing to their solution processability, potential low cost of fabrication, light weight and high transparency. At this time, the power conversion efficiency (PCE) of solution-processed organic solar cells based on a single BHJ active layer using a low-band-gap small molecule has exceeded 10%, which is comparable to those of polymer counterparts.

Porphyrins, which are synthetic analogues of natural chlorophylls, are of special interest, because they are known to be a natural choice as light-harvesting antenna systems that are involved in energy and electron transfer processes. In recent years, there has been a great focus of interest on the field of solution-processed BHJ organic solar cells using porphyrin derivatives as donors, which resulted in PCEs up to 9%. [1]

Here, we will present the synthesis, optical, electrochemical and photovoltaic properties of new porphyrin A-D-A and D-A-D derivatives used as donor, in BHJ solar cells, with PC71BM as acceptor reaching excellent efficiencies, higher than 8%.

Figures

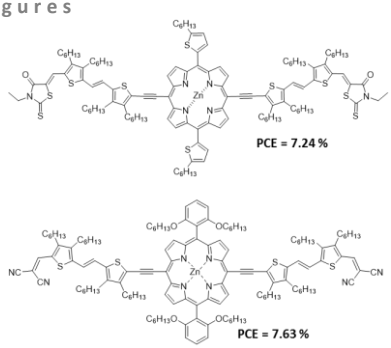

Figure 1: Porphyrin based donors used in solar cells presented here.

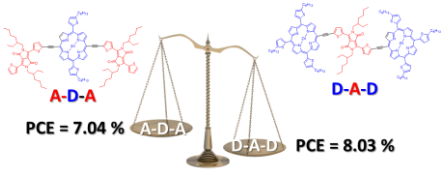

Figure 2: Compared efficiencies of D-A-D and A-D-A donors in solar cells.

References

[1] K. Gao, J. Miao, L. Xiao, W. Deng, Y. Kan, T. Liang, C. Wang, F. Huang, J. Peng, Y. Cao, F. Liu, T. P. Russell, H. Wu, X. Peng. Adv. Mater. 28, 2016, 4727.

[2] G. Morán, S. Arrechea, P. de la Cruz, V. Cuesta, S. Biswas, E. Palomares, G. D. Sharma and F. Langa, *J. Mater. Chem. A,* 4, 2016, 11009.

[3] S. Arrechea, A. Aljarilla, P. de la Cruz, E. Palomares G. D. Sharma, F. Langa. *Nanoscale* 8, 2016, 17953.

[4] A V. Cuesta, M. Vartanian, P. de la Cruz, R. Singhal, G. D. Sharma and F. *J. Mater. Chem. A* (submitted)

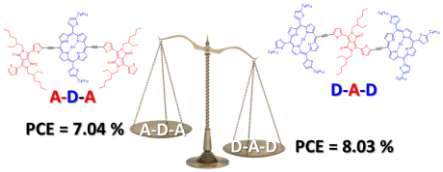

Figure 2: Efficiencies of D-A-D and A-D-A