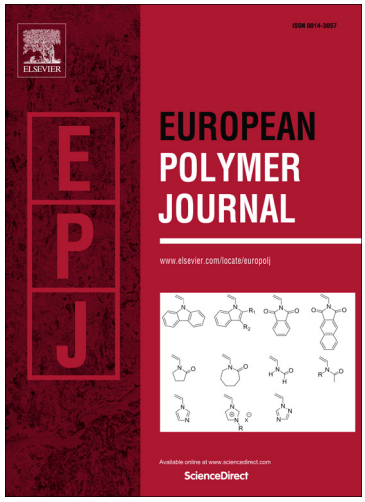
Accepted Manuscript



Optimization of the power conversion efficiency in high bandgap pyridopyridinedithiophene -based conjugated polymers for organic photovoltaics by the random terpolymer approach

Desta Gedefaw, Anirudh Sharma, Xun Pan, Jonas M. Bjuggren, Renee Kroon, Vasilis G. Gregoriou, Christos L. Chochos, Mats R. Andersson

PII: S0014-3057(17)30148-9
DOI: http://dx.doi.org/10.1016/j.eurpolymj.2017.03.044
Reference: EPJ 7793

To appear in: *European Polymer Journal*

Received Date: 29 January 2017
Revised Date: 19 February 2017
Accepted Date: 22 March 2017

Please cite this article as: Gedefaw, D., Sharma, A., Pan, X., Bjuggren, J.M., Kroon, R., Gregoriou, V.G., Chochos, C.L., Andersson, M.R., Optimization of the power conversion efficiency in high bandgap pyridopyridinedithiophene -based conjugated polymers for organic photovoltaics by the random terpolymer approach, *European Polymer Journal* (2017), doi: http://dx.doi.org/10.1016/j.eurpolymj.2017.03.044

Optimization of the power conversion efficiency in high bandgap pyridopyridinedithiophene -based conjugated polymers for organic photovoltaics by the random terpolymer approach

Desta Gedefaw[a*], Anirudh Sharma[a], Xun Pan[a], Jonas M. Bjuggren[a], Renee Kroon[b], Vasilis G. Gregoriou[c], Christos L. Chochos[c], Mats R. Andersson[b, d*]

[a]Future Industries Institute, University of South Australia, Mawson Lakes, South Australia 5095, Australia

[b]Department of Chemistry and Chemical Engineering, Polymer Technology, Chalmers University of Technology, Göteborg SE-412 96, Sweden

[c]Advent Technologies SA, Patras Science Park, Stadiou Street, Platani-Rio, 26504, Patra, Greece

[d]School of Chemical and Physical Sciences, Flinders University, Adelaide 5001, South Australia, Australia

*Corresponding authors. DG (desta.gedefaw@unisa.edu.au) and MA (mats.andersson@flinders.edu.au)

Abstract

We report that the organic photovoltaic (OPV) performance of wide band gap pyridopyridinedithiophene -based conjugated polymers can be significantly improved by employing the random terpolymer approach for the development of new pyridopyridinedithiophene -based conjugated polymers. This is demonstrated by the synthesis of the alternating copolymer (P1) consisting of 3,3'-difluoro-2,2'-bithiophene and pyridopyridinedithiophene and the random terpolymer (P2) containing pyridopyridinedithiophene 3,3'-difluoro-2,2'-bithiophene and thiophene. OPV devices fabricated by P1 and P2 in combination with $PC_{61}BM$ and $PC_{71}BM$ in an inverted device configuration exhibited power conversion efficiencies (PCEs) of 1.5% and 4.0%, respectively. We identified that the main reason for the enhanced performance of the OPV devices based on the P2 random copolymer was the improved morphology (miscibility) between P2 and PCBM as compared to P1. More specifically, atomic force microscopy (AFM) and scanning electron microscopy (SEM) studies revealed that the P1 based films showed rougher surface with clear crystallization/precipitation of the polymer chains even