Functional low-band gap electron donors and their Copolymeric and Hybrid structures for organic electronics

S. Aivali[1], S. Kakogianni[1], C. Anastasopoulos[1], A. K. Andreopoulou[1,2], J. K. Kallitsis[1,2]

[1]Department of Chemistry, University of Patras, Rio 26504, Greece.

[2]Institute of Chemical Engineering Science Foundation of research Technology Hellas FORTH/ICE-HT, Patras 26504, Greece

Introduction

The main routes towards more efficient organic solar cells are the development of more efficient electron-donors or electron-acceptors, control and stabilization of their morphology. In the first case and over the last years a vast number of electron donors has been reported whereas the morphology of the active layer still remains a challenge in terms of nanophase separation and stabilization The introduction of a hybrid compatibilizer, bearing both an electron donating polymer and electron accepting fullerene unit, has been suggested in order to enhance the stability of the active blend of the net components.

Herein are presented low band-gap polymers belonging to PCDTBT family that were modified with ω-chain end functionalities, e.g perfluorophenyl or vinyl. The vinyl-functionalized PCDTBTs were used as comonomers in free radical polymerization with electron accepting monomers. The co-polymeric materials were used for hybrid synthesis based on previously reported methodology.

Functional PCDTBT

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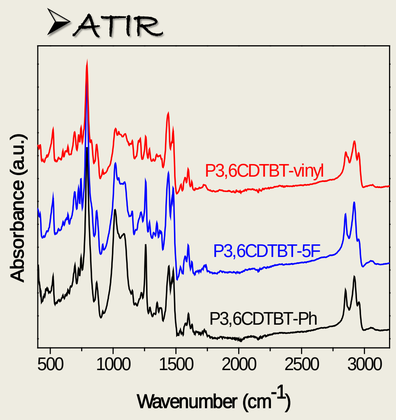
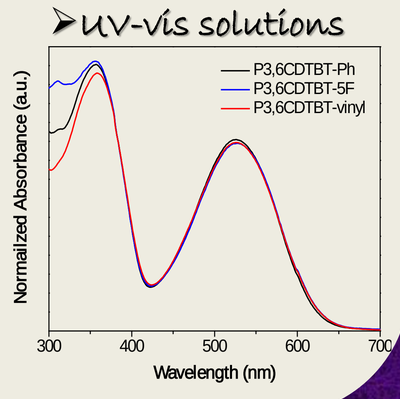
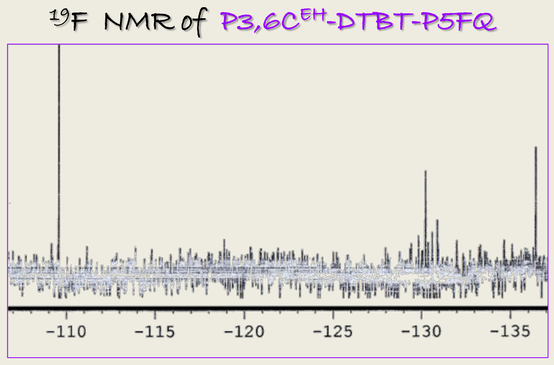


➢UV-vis solutions



Copolymers

^{19}F NMR of P3,6C^{EH}-DTBT-P5FQ



➢Copolymerization of PC3,6^{EH}DTBT- PQPy

➢ Purified PC3,6^{EH}DTBT- P5FQ

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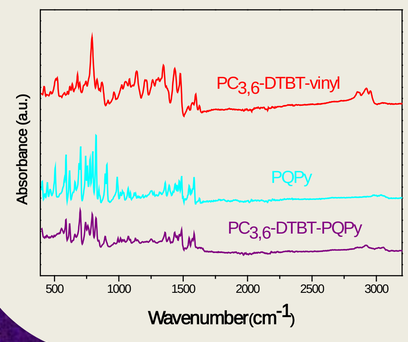
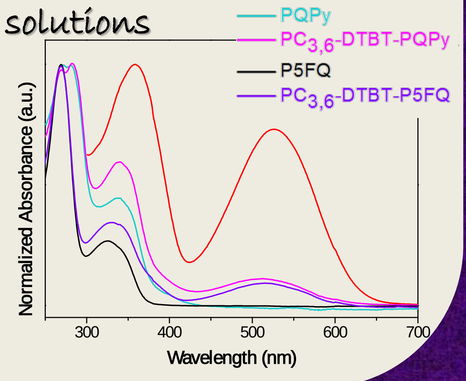
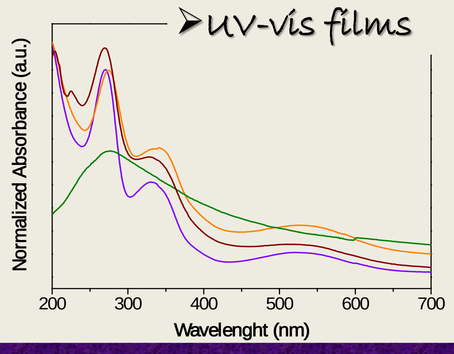


➢UV-vis solutions



Hybrids structures

➢UV-vis films



Conclusions

✓ P3,6CDTBT derivatives were successfully functionalized with vinyl and perfluorophenyl units.

✓ P3,6CDTBT-vinyl can be copolymerized with other vinylic monomers through FRP polymerization affording block type copolymers.

✓ P3,6CDTBT-P5FQ copolymers were successfully transformed into azides and performed a cycloaddition reaction with sp²-hybridized carbon nanostructures.

Acnowledgements

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