New Oligomers for Organic Photovoltaics
Syntheses and Interface Properties

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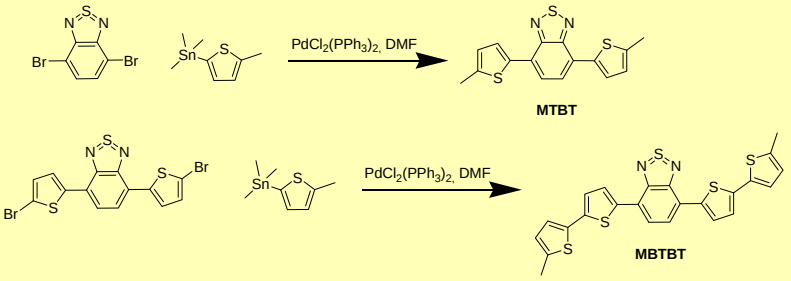
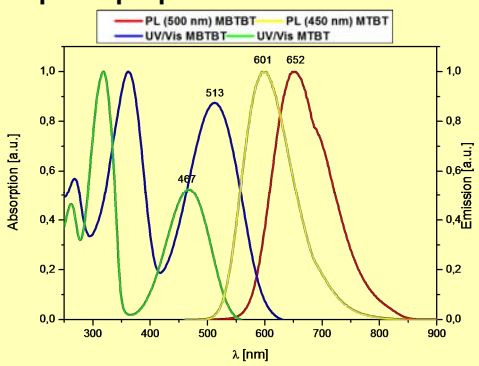
Abstract

Low bandgap polymers are a promissing approach to improve the energy output of organic solar cells. Both the spectral overlap with the solar spectrum and the energy levels of these material are crucial for application. Within this contribution we present the synthesis and characterization of a series *bis*(oligothienyl)benzothiadiazole oligomers. These oligomers are used as model for the building blocks of the corresponding copolymers. A red-shifted long wavelength absorption with increasing length of the oligomer is observed. The interface characterization on gold reveals a strongly located interaction between gold and the component.

Synthesis



Optical properties of MTBT & MBTBT



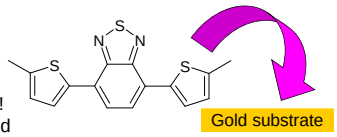
Normalised absorption/emission spectra in CH_2Cl_2

Interface investigation of MTBT on Au foil

Experiment

1) Controlled step by step evaporation of MTBT under ultra high vacuum conditions

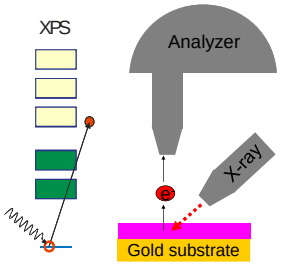
Defined thin films can be produced! Interface is created and investigated step by step!



2) Investigation of thin films using X- ray techniques (XPS, NEXAFS)

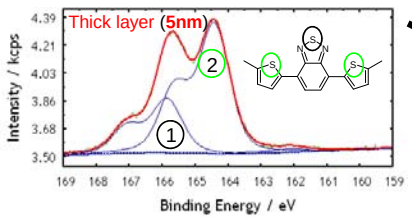
Information content:

Chemical states, Electronic states
Layer composition, growth mode
depth profile

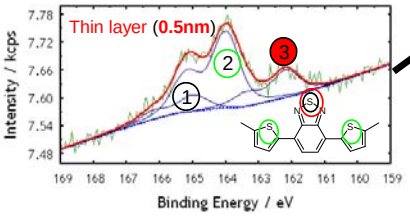


Results

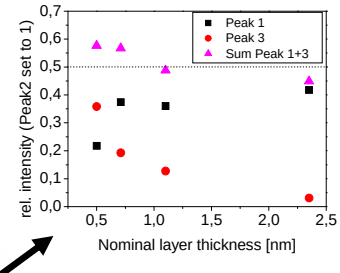
Evolution of the S2p signal with increasing layer thickness



Two signals (ratio 2:1) are expected from the molecular structure!



Peak3 is assigned to an interface effect!



Ratio **(Peak1+Peak3):Peak2**

For each layer thickness **0.5 : 1**

Peak 1 and Peak 3 arise from the benzothiadiazole sulphur!

Conclusion

- Oligomers **MTBT** & **MBTBT** were synthesised and their spectral and photophysical behaviour studied
- Both oligomers show red-shifted long wavelength absorption maximum with increasing length
- **MTBT** has been investigated by XPS and NEXAFS for its interaction at the Au interface
- Benzothiadiazole sulfur shows an additional feature for its interaction with Au interface
- Similar measurements for **MBTBT** are in progress
- Donor-acceptor oligomers are potential candidates as active semiconducting layers in bulk heterojunction and bilayer organic solar cells
- Future work will use ITO substrates