

## Project Summary 3

### **Organic solar cells based on oligothiophene derivatives**

Based on our fruitful collaboration since starting the joint project, we plan to continue working towards establishing a detailed link between the structure of the photovoltaic active molecules and the electro-optical properties of solar cells made from them. Combining the experience and knowhow of a synthetic chemistry group and an experimental physics group, this interdisciplinary research focuses on the consequences that changes in the molecular structure of organic semiconductors have on molecular stacking, absorption, transport properties of thin layers, and the charge carrier and exciton dynamics at the donor-acceptor heterojunction, i.e. the central process of all efficient organic solar cell. The used model system, acceptorsubstituted oligothiophenes, have been proven as very versatile and efficient donor molecules, because they allow both for a systematic variation of their structural and electro-optical properties and have the potential for very efficient solar cells. The investigations so far focused on oligothiophene derivatives with variations of the length of the thiophene backbone and of the alkyl side chains. Especially, the position and length of the alkyl side chains were found to be more influential than initially expected and based on these results, further oligothiophenes will be specifically designed and synthesised for an intrinsic morphology tuning. These compounds subsequently will be characterised in evaporated pristine films, blends with C60 as acceptor, and in complete single junction and tandem p-i-n solar cells with closed feedback loop back to the synthesis work. Benefitting and using the systematic variability of the oligothiophenes, a better understanding of the elementary processes in small-molecule organic photovoltaics is expected, supporting more directed research towards devices with higher efficiencies.