Summery

The proposed work aims at the understanding and the advancement of the photovoltaic properties of polymer-based organic solar cells by optimizing the electron-transport properties of the electron-accepting phase. Novel “low bandgap” electron-accepting copolymers based on naphthalenebisimide with improved electron mobility will be synthesized. The HOMO and LUMO energy levels of these copolymers are designed for a combination with well-established electron-donating polymers such as poly(3-hexylthiophene) (P3HT). Electron-transport in the pure polymer and in the blend will be studied and related to the photovoltaic device performance. In order to optimize the optical and electron-transporting properties of these bulk-heterojunction devices, ternary blends comprising an electron-donating polymer, an electron accepting polymer and the well-known soluble fullerene PCBM will be investigated with respect to morphology, charge transport and solar cell properties. Hereby, the adjustment of the LUMO level of the acceptor-polymer with respect to the energetical structure of PCBM by chemical design will be one important task of this project. By using acceptor polymers with low bandgap, wide spectral coverage is envisaged. Finally, the influence of additives as block copolymers or low molecular weight softeners (and surfactants) on the morphology of polymer-polymer blends will be investigated, with the goal to develop novel approaches towards polymer blends with high charge carrier dissociation and extraction efficiencies.