Summery

The project focuses on polymer interfaces that are of direct relevance for organic photovoltaic cells (OPVCs), their function and efficiency. Our goal is to provide a complete understanding of the energy levels and charge carrier dynamics at all interfaces that occur in polymer/polymer heterojunction photovoltaic cells (i.e., donor polymer/anode, donor/acceptor and acceptor polymer/cathode interfaces) and how these energy levels influence the OPVC energy conversion efficiency. These interfaces comprise new polythiophenebased donor polymers, and in this second project phase also imide-substituted acceptor copolymers, available through collaboration with the Scherf group (Uni Wuppertal) within this priority program. Using one- and two-photon photoemission (2PPE) spectroscopy all relevant properties that determine the open circuit voltage (i.e., polymer/electrode work function, energy offset between polymer valence and conduction bands, offset between donor valence and acceptor conduction band) will be will determined. In addition time-resolved 2PPE provides access to the charge carrier dynamics at polymer/electrode interfaces. These values will be used, in combination with OPVC characterization, to test existing device models, and to provide a reliable parameter base for improved understanding of device function. This work is performed in close cooperation with the project of Neher/Scherf (Uni Potsdam/Uni Wuppertal) which employs the same semiconducting polymers for OPVC fabrication and characterization. These concerted efforts will provide elementary physical properties of polymer interfaces and full characterization of OPVCs and will thus lead to a significant advance in the understanding of elementary processes of organic photovoltaics.