Summery

The project focuses at understanding of how covalent preorganization of conjugated polymers (CPs) grafted to nanoparticles effects their photovoltaic (PV) properties. Using newly developed in the Dresden group surface-initiated Kumada polycondensation two series of hairy nanoparticles with systematically variable grafting density having either i) end-grafted poly(3-hexylthiophene) or ii) low bandgap copolymer shell (thiophene, fluorene and thienopyrazine-based), will be synthesized. Solution-processed solar cells will be prepared in the Risø DTU group from the two kinds of hairy particles in a combination with PCBM or ZnO nanoparticles. The influence of the grafting density on PV properties will be systematically investigated; the results will be compared with the performance of the corresponding linear CPs. An inherent advantage of our “preorganization” approach is that the chains formed by simultaneous polymerization from the surface automatically appear to be staked parallel to one another and stretched that should favor charge and energy transport even in the case of usually amorphous random copolymers. Further, a fine engineering of the internal composition of the hairy particles, such as preparation of desired gradients and positioning of various functions at the periphery of the particles, should be straightforward with our grafting-from approach that is a new and potentially powerful tool in regulation of self-assembly, charge-separation and charge recombination processes.