Summary

The goal of the present project is to gain synthetic control over the π–π backbone-backbone interchain distance of low band gap poly(p-arylene-ethynylene)-alt-poly(-p-arylene-vinylene)s based copolymers and to investigate its influence on the nanoscale morphology of the polymer-fullerene bulk heterojunction and its implications on photovoltaic performance of the solar cell. The polymers will be synthesized through Horner-Wadsworth-Emmons olefination reaction of fluorophoric dialdehydes with bisphosphonate esters and be characterized using common polymeric characterization methods. Grafting solubilizing alkoxy side chains will on the one hand guarantee a good contact between polymer and fullerene, and on the other hand control the π–π stacking distance, which will be investigated in detail by wide angle x-ray scattering methods. The morphology shall be investigated over a broad length scale range by non-contact atomic force microscopy, scattering methods and microscopy to evaluate the scale of phase separation and the homogeneity of the films. We aim to correlate the π–π stacking distance with the film morphology and the resulting photovoltaic properties. This will be used for future optimization of adapted conjugated polymer synthesis for photovoltaics.