Summary

Merocyanine dyes are widely applied in nonlinear-optical and photorefractive materials. Based on our recent discovery of remarkably efficient solution-cast bulk heterojunction (BHJ) solar cells composed of blends between low molecular weight merocyanine dyes and C60 fullerene (power conversion efficiency > 1.0 %) this project will explore the scope for this entirely new class of photovoltaic materials. Toward this goal bis-merocyanine dyes with absorption bands over the whole visible range will be synthesized and their aggregation-driven supramolecular polymerization will be elucidated. These supramolecular polymers will be optimized toward favourable viscosity properties for solution processing and to provide self-assembled percolation pathways for charge transport upon blend formation. Merocyanines can support electron and hole transport and thus blends with fullerene-based electron acceptors or P3HT-based electron donor materials will be investigated. The electrical properties of merocyanines will be investigated by ultrafast cyclic voltammetry in solution and compared to HOMO and LUMO levels obtained by Kelvin-probe and photoelectron spectroscopy. Photovoltaic cells will be prepared and their performance will be related to the molecular, supramolecular and nanomorphology properties.