Summery

This proposal elaborates on an interdisciplinary approach, combining the synthesis, device physics, materials research, and process engineering expertise from the different network partners with the objective of both improved and more versatile single active layer solar cells and a better understanding of fundamental processes determining the efficiencies. In addition we will shift the project towards the realization of organic tandem and multijunction solar cells.
Our work will mainly address the following issues:
• The synthesis and identification of adequate solution processable materials which complement each other in terms of the absorption spectra. For shifting the absorption spectrum and for improving the transport properties oligomeric and polymeric materials research will be continued based on the encouraging results of the first funding period. Again we will also perform comparative studies using commercially available materials within the project.
• Within the first funding period we have started to perform in-situ studies of morphology formation and film drying. We will intensify this very promising work. The systematic investigation of the drying behavior will be correlated with the resulting macroscopic optoelectronic properties and a detailed structural investigation using Xray diffraction (XRD), Atomic Force Microscopy (AFM) and newly installed Kelvin Probe Force Microscopy (KPFM). Based on the thermodynamic insights of the first funding period we will also address the use of multicomponent solvents which are a means to control the drying behavior of the wet films.
• Both, transparent conductive oxidic as well as solution processable organic electrodes have been studied in the first funding period. Based on the results into both classes we will intensify the work on tandem structures which comprise these electrodes and complementary absorptive layers. The critical optoelectronic and electrical parameters of the resulting devices will be studied systematically for these compound devices. For a deeper understanding of the field distribution and the efficiency of the recombination zone we will continue to use the combined approach of simulations and optoelectronics studies, especially using the transient photoresponse.