"Hybrid Materials for Efficient Energy Generation and Information Technologies"

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Title: Exciton Diffusion in Hybrid Solar Cells – *An Experimental Challenge*

Hybrid solar cells combine inorganic and organic semiconductors with tailored properties. Organic semiconductors have very high absorption coefficients, which makes some particular suited as the main light-absorption species in these hybrid devices. Therefore, knowledge about the fate of excitons generated on the organic component is of crucial importance for the understanding and further optimization the device structure and composition. But while charge transport in organic semiconductors has been widely studied, exciton diffusion is only poorly understood. This is particularly true for conjugated polymers, where exciton diffusion is typically limited to a 5-15 nm length scale. Because of the short diffusion length, a more thoroughly understanding of exciton motion in conjugated organic materials asks for the investigation of systems with a highly-defined structure and well-known morphological and electronic properties.

The aim of the project is to perform an extensive experimental study of exciton diffusion and quenching in organic semiconducting layer deposited on well-defined inorganic semiconductor surfaces. The work will comprise detailed investigations of the morphology and the electronic structure of the organic layer, the measurement of the transient and steady state emission properties, and the study of the efficiency and dynamics of exciton split-up at the hybrid interface.

With this combined theoretical-experimental knowledge, we hope to get a comprehensive understanding of the processes which determine the exciton diffusion length in conjugated materials as part of a hybrid solar cell device. The outcome of these studies will not only lead to a better understanding of the function of hybrid solar cells, but allow more general conclusions regarding then migration of energy in conjugated organic materials