



SONDERKOLLOQUIUM

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IM SEMINARRAUM GUSTAV-MIE-HAUS

SOLUTION-PROCESSABLE ORGANIC PHOTOVOLTAICS: FUNDAMENTALS, TRANSPORT AND MORPHOLOGY

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During the last 10 years organic photovoltaics (OPVs) has evolved from an early research effort to a major main stream research field and a tremendous progress has been made in the synthesis and production of organic solar cells. Compared to inorganic solar cells, organic photovoltaics offer many advantages, such as low cost, high throughput production, flexible devices, and lightweight products, as well as custom-designed colors. On the down side, OPVs still have significantly lower efficiency values and lifetime expectations as compared to their inorganic counterparts. To boost the efficiency, different strategies have to be developed in parallel. For example, a fundamental understanding of different class of materials in the molecular level is required to design novel high efficiency compounds. A deep insight into the solubility and solvent formulation as well as drying kinetics supports us to optimize the morphology and consequently improve the device performance. Engineering the interface layers can effectively suppress the interface recombination, modify the work function, remove the extraction barriers and enhance the charge collection as well as environmental stability. Furthermore, implementation of more advanced approaches such as tandem and ternary solar cells enhances the light harvesting in OPVs, leading to an essential performance improvement. In this presentation, we discuss our highlight achievements on the aforementioned topics with a central focus on the fundamentals, transport and microstructure studies.

To head towards technical demonstration of the roll-to-roll mass-production of OPVs, in addition to the efficiency and stability issues, an enormous amount of attention and efforts has to be dedicated to the green formulation and water/alcohol based production of the OPV technology. As future research plan, a general overview will be presented on different strategies of exploration and development of the "Solution-processable green photovoltaics", including semiconductors comprised of natural dye pigments and their derivatives, and colloidal, emulsion and nanoparticles applicable as photoactive layer

