THE CHINESE UNIVERSITY OF HONG KONG

Department of Physics

COLLOQUIUM

Organic and Hybrid Nanostructures for Applications in Solar Cells Investigated with Advanced Scattering Techniques

by

Professor Peter MÜLLER-BUSCHBAUM
Heinz Maier-Leibnitz Zentrum (MLZ) &
Physik-Department
Technische Universität München, Germany

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Join ZOOM Meeting: https://cuhk.zoom.us/j/99600608566

ALL INTERESTED ARE WELCOME
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Abstract

Among the next generation solar cells, in particular organic and hybrid photovoltaics are gaining impact as a promising alternative to conventional silicon-based solar cells. Using nanostructured organic and hybrid films as active material for the energy conversion offers several potential advantages, as for instance the material availability and low-cost processing techniques. Due to the potential device flexibility and tunable colors and shapes, organic photovoltaics could be integrated into a wide range of applications, combining functionality with design in fields as diverse as mobility, architecture or clothing. However, efficiencies and lifetimes of these solar cells still stay below those of their commercially available inorganic counterparts, which demonstrates the need for strengthened fundamental understanding.

In particular, the morphology of the active layer of organic and hybrid solar cells is of highest importance for the device performance, because it needs to facilitate exciton creation, exiton migration and splitting at tailored interfaces and transport of the generated charge carriers to the corresponding electrodes. All these different tasks require an optimized nanostructure, which in turn requires techniques being capable of probing these nanostructures of the active layers of solar cells. Using advanced scattering techniques such as grazing incidence small angle x-ray and neutron scattering (GISAXS and GISANS) together with grazing incidence wide angle x-ray scattering (GIWAXS) enables to probe the morphology of the active layers from the molecular to the mesoscopic scale. With x-ray and neutron reflectivity (XRR and NR) the density profile along the surface normal is probed. As a result a structure function-relationship can be established, which provides insights into fundamentals of organic and hybrid solar cells. In-situ investigations with GISAXS/GISANS, GIWAXS and XRR/NR enable deeper understanding of film formation and device degradation.

Enquiries: 3943 6303