JOHANNES KEPLER UNIVERSITÄT LINZ

P H Y S I K K O L L O Q U I U M

Fachbereich für Physik

Im Rahmen des Physikkolloquiums spricht

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über

In-situ studies of organic thin films

Abstract:

Organic thin films gain more and more importance in optoelectronic devices like LEDs (OLED), field effect transistors (OFET), and solar cells. The performance of these devices correlates strongly to the quality of the organic thin films. Besides the number of defects, one has also to take the crystalline structure of the films into account. In particular for ultrathin films, the crystalline structure is also ruled by the interaction to the substrate. Therefore, a Stranski-Krastanov growth mode is quite common for the deposition of organic molecules, i.e., after forming a wetting layer 3D crystallites grow on top of it.

To study the transition from 2D to 3D growth, Photoelectron Emission Microscopy (PEEM) and Differential Reflectance Spectroscopy (DRS) are applied. Both experimental techniques can be applied in situ and in real-time during the deposition of organic thin films. In particular, PEEM has a lateral resolution in the 100 nm range, which allows obtaining local information on the wetting layer and on µm sized crystallites. In spectroscopic mode, the electronic density of states is accessible like in traditional UPS but with a much better resolution. By using linear polarized light for the excitation of the photoelectrons, an additional image contrast can be achieved making the PEEM not only sensible to the morphology of the sample but also to the different orientations of the molecules with respect to the surface.

DRS compares the reflectivity of the bare surface with the one of the surface after deposition of molecules. The good signal-to-noise ratio allows following the optical properties even with submonolayer resolution. Due to the different environment of the molecules in the first, the second, and higher layers, these layers can be easily identified based on their spectral fingerprints. For anisotropic samples, linear polarized light (pol-DRS) can be used to obtain information about the orientation of the molecules in respect to the surface plan.

The combination of both techniques, applied synchronized in one experiment, turns out to be a very powerful tool to make a direct correlation of the morphology to the optical properties of the sample. As an example, the deposition of α-sexithiophene on different silver surfaces will be discussed throughout the entire presentation.

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