Organic Thin Films: Characterization and Devices

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In this contribution we give an overview of the work that is done within the epitaxy group of the Johannes Kepler University Linz on the field of growth of organic thin films and characterization of organic thin films devices. Organic semiconductors like Para-sexiphenyl (PSP), Rubrene and C_{60} are some examples of promising materials for applications on organic electronic devices due to their unique optical and electrical properties.[1-3]. Thin films of this materials are deposited by Hot Wall Epitaxy (HWE) on various substrates and the electrical, optical and structural properties are characterized.

PSP has been deposited on Polynorbornene, a photosensitive polymer, which has been prepatterned by UV illumination leading to a change of the surface polarity [4]. A detailed analysis of the growth morphology as a function of substrate temperature, growth time and UV illumination has been performed by AFM measurements. Furthermore crystallographic structure has been analyses by x-ray diffraction experiments. A clear change of both, surface morphology and crystallinity has been observed between the illuminated and not illuminated part of the substrate.

Rubrene, a derivative of tetracene with phenyl substituents attached to the side of the tetracene backbone, has recently gained much interest. In addition, it exhibits one of the highest reported electronic mobilities at room temperature observed in field effect transistor devices (20 cm^2/V.s)[2]. However, this high mobility was obtained only in single crystalline bulk material. The big challenge is to demonstrate similar results in thin films of Rubrene by evaporating it on different substrates by HWE. The morphology of the thin films had been investigated by different techniques as a basic requirement for further improvement.

HWE deposited C_{60} fullerene is used as an active layer for field effect transistors (FET). The electron mobilities reached for these devices is ~ 1 cm^2/V.s [3]. By performing low temperature measurements of the FET's we want to study its correlation with the electron mobility.

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