

# Seminář odd. 26

## Tenkých vrstev a nanostruktur

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### TÉMA

## Growth of small organic molecules on graphene

**Christian Teichert**

Institute of Physics, Montanuniversität Leoben, Austria

Crystalline films of small organic semiconductors offer attractive potential for optoelectronic applications on flexible substrates. However, these applications require a transparent and flexible electrode material; and here the novel material graphene (Gr) comes into play. Since small conjugated molecules like the rod-like oligophenylene molecule para-hexaphenyl (6P) fits well to the hexagonal structure of graphene, growth of 6P on Gr can be expected in a lying configuration.

As demonstrated by in situ by low-energy electron microscopy, 6P grows at 240 K indeed in a layer-by-layer mode with lying molecular orientation on Ir(111) supported graphene [1]. Islands nucleate at Gr wrinkles [2]. At higher temperatures, needle-like 6P crystallites - also composed of lying molecules are observed [3]. Also on exfoliated, wrinkle-free graphene, such needles develop with discrete orientations defined by the Gr lattice as detected by atomic-force microscopy (AFM) [4, 5]. Needles are never observed on contaminations or on the silicon oxide substrate. There, exclusively islands and terraced mounds [6] composed of upright standing molecules are observed. Since these structures are easily detected by AFM, growth of 6P can be used to sense the cleanliness of a variety of graphene substrates.

[1] G. Hlawacek, et al., Nano Lett. 11 (2011) 333.

[2] G. Hlawacek, et al., IBM J. Res. Devel. 55 (2011) 15.

[3] F. Khokar, et al., Surf. Sci. 606 (2012) 475.

[4] M. Kratzer, et al., JVSTB 31 (2013) 04D114.

[5] M. Kratzer, et al., e-J. Surf. Sci. Nanotechn. 12 (2014) 015303. [6] G. Hlawacek, et al., Science 321 (2008) 108.

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