EPITAXY OF HIGHLY ORDERED CONJUGATED ORGANIC SEMICONDUCTOR CRYSTALLITE NETWORKS ON GRAPHENE BASED DEVICES

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We focus on the hot wall epitaxial growth of sub-monolayer films of a rod-like conjugated organic semiconductor (OSC), para-hexaphenyl (C36H26, 6P) [1-3], on the surface of graphene based devices. For this purpose, mechanically exfoliated flakes supported by SiO_2/Si substrates are used and contacted in a back-gated two-point probe field effect device configuration.

Charge transfer and doping of graphene channel by OSCs are investigated in situ. Atomic force microscopy (AFM) is used to characterize OSC crystallite morphology (Fig.1a), and Kelvin probe force microcopy (KPFM) is used to investigate changes in the work functions of graphene and 6P crystallites with applied external electric fields (Fig.1b). Furthermore, we show how residues from the lithography and annealing steps affect morphology of the grown OSC thin films.

Van der Waals nature of the interface between OSCs and graphene allows for the growth of crystallites that are several tens of micrometers large, thus minimizing the number of OSC grain boundaries within the device channel, and allowing investigations of the intrinsic properties of the OSCs.

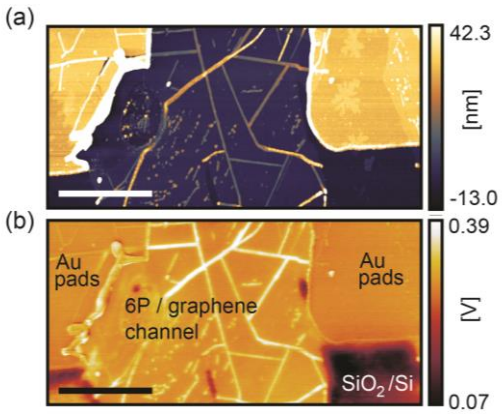

Fig.1. (a) and (b) respectively show AFM and KPFM images of the same 6P/graphene channel area, with grounded back-gate electrode (scale bars 5 µm).

Keywords: hybrid organic/inorganic van der Waals interfaces, charge transfer OSC/graphene, KPFM of OSC crystallites.

References

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