Nanoobjects Microscopy

Bilayer Films of *n*-Alkanes: STM-study in liquid/solid interface

Ya.Yu. Lopatina, V.Ye. Kutsenko, A.I. Senenko, A.A. Marchenko

Department of Physical electronics, Institute of Physics, Nat. Acad. of Sci. of Ukraine. Prospect Nauki, 46, Kyiv-03039, Ukraine.
E-mail: yaroslava.lopatina@gmail.com

The current stage of development of electronics requires the use of single atoms, molecules, and ultrathin organic films as basic components of different nanodevices including integrated circuits. The properties of such films depend on degree of order and epitaxial relationships with solid surfaces. In this context investigation of ultrathin organic films is one of the most important directions in modern surface science.

The films of long chain *n*-alkanes (*n*=48, 50, 60) absorbed on highly oriented pyrolitic graphite (HOPG) have been investigated using scanning tunneling microscopy (STM) in liquid-solid interface. We have revealed that at the certain conditions of deposition (temperature, concentration of solutions) and scanning parameters (tunnel current, bias voltage) – the second *n*-alkane layer can be imaged in STM (Fig.1).

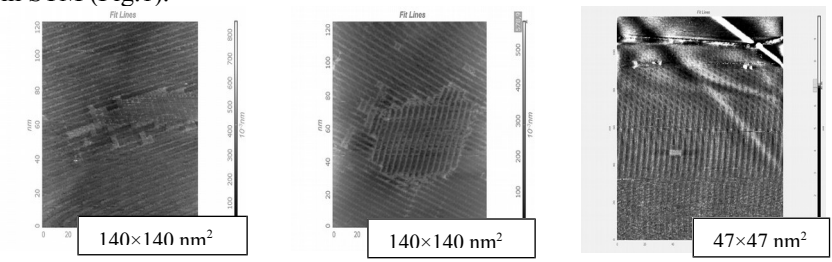

Fig.1. STM-images of bilayer of long n-alkanes: (a) $-C_{48}H_{98}$, (b) – $C_{50}H_{102}$ on HOPG surface. (c) – "magic" clusters of $C_{60}H_{122}$.

Remarkably, the structure and orientation of second layer are in contrast with corresponding ones in bulk crystal. Two possible orientations for the second layer were detected: molecules are parallel to the molecules in the first layer (Fig.1a) or rotated by 60° (Fig.1b). Fragmentation in the second layer with formation of so-called "magic" clusters" is observed (Fig.1c). These "magic" clusters have rectangular shape with dimensions multiple to the length of alkane molecules. The observed anomalies of alkane film growth are explained in terms of commensurability between underlying substrate and alkyl chain.