



Contribution ID: 186
compétition)

Type: Oral (Student, Not in Competition) / Orale (Étudiant(e), pas dans la

Ordered supramolecular polythiophene structures on passivated silicon surfaces.

Tuesday, 17 June 2014 09:15 (15 minutes)

The functionalization of semiconductor surfaces with organic molecules is a necessary step in the development of hybrid organic-semiconductor structures. A significant challenge to organic layer formation is the fact that semiconducting surfaces exhibit a large number of dangling bonds which suppress the diffusivity of adsorbed molecules and can even break the molecules apart via the formation of Si-C bonds. Recently it has been shown that these problems can be obviated by depositing the molecules onto a passivated surface [1].

We have studied the adsorption of brominated tetrathienoanthracene molecules (TBTTA) onto the Si(111)- $\sqrt{3}\times\sqrt{3}$ -Ag surface. Thiophene based molecules like TBTTA are of considerable interest in organic semiconductor research due to their efficient conjugation and the chemical stability [2]. The Si(111) $\sqrt{3}\times\sqrt{3}$ -Ag surface has no Si dangling bonds and should provide a high mobility surface suitable for TBTTA adsorption. Scanning Tunneling Microscopy images reveal that at low coverage the molecules readily migrate to step edges and defects in the $\sqrt{3}$ overlayer, in fact many images show direct evidence of molecular mobility. With increasing coverage the molecules eventually form compact supramolecular structures. In terms of the $\sqrt{3}$ lattice vectors (\mathbf{a} and \mathbf{b}), the oblique unit cell of the supramolecular structures is $\mathbf{a}' = 3\mathbf{a} + \mathbf{b}$, and $\mathbf{b}' = \mathbf{a} + 2\mathbf{b}$. These structures are quite fragile and can decompose under repeated STM imaging. Our results suggest that TBTTA is weakly bound to the $\sqrt{3}$ surface at room temperature and that the supramolecular structures are held together by weak van der Waals forces.

1. T. Suzuki et al., *Phys. Chem. Chem. Phys.* **11**, 6498–6504 (2009).
2. R. Gutzler et al., *Nanoscale* **6**, 2660-2668 (2014).

Primary author: Mr LIU, Renjie (Lakehead University)

Co-authors: Ms FU, Chaoying (McGill University); Prof. PEREPICHKA, Dmytro (McGill University); GALLAGHER, Mark (Lakehead University)

Presenter: Mr LIU, Renjie (Lakehead University)

Session Classification: (T1-8) Surfaces and Thin Films - DCMMP-DSS / Surfaces et couches minces - DPMCM-DSS

Track Classification: Surface Science / Science des surfaces (DSS)