

STM AND STS EXPLORATIONS OF SELF-ASSEMBLED DODECAKIS(PHENYLTHIO)CORONENE FILMS ON HOPG

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Promising physical and chemical properties of novel organic compounds [1] and their use as active components in electronic devices is the motivation for an intense research activity in the field of highly ordered organic thin films [2]. In particular, large polycyclic aromatic molecules like hexa-peri-hexabenzocoronenes which have been shown to self-assemble to supramolecular structures seem to have advantageous electronic features such as the characteristics of a single-molecular rectifier in the junction of a STM [3] and the potential use as nanowires with high charge carrier mobilities [4].

Here we report on a scanning tunneling microscopy and spectroscopy study of the self-assembly and the electronic properties of dodecakis(phenylthio)coronenes. It has been shown that such derivatised coronenes may for instance present a potential class of electron accepting units in molecular devices [5,6].

Dry layers of the investigated molecules were grown on freshly cleaved highly oriented pyrolytic graphite (HOPG) from solution and then characterized by means of STM under UHV-conditions. The deposition method results in highly ordered two dimensional crystal structures where several phases of the assembled molecules could be found. Monolayers of dodecakis(phenylthio)coronenes exhibit a hexagonally close-packed structure of flat-lying molecules (see fig. 1) with defect-free domain sizes larger than $100 \times 100 \text{ nm}^2$. Tunneling spectra were taken on these molecular layers to study the electronic states and transport properties of the adsorbed molecules.

In addition to layers of separated single molecules we observed hexagonal arrangements of clustered molecules. Several dodecakis(phenylthio)coronene aggregates assemble again in ordered films on the substrate. We will show that structures of these molecule clusters with different size and lattice constants can be self-assembled.

References:

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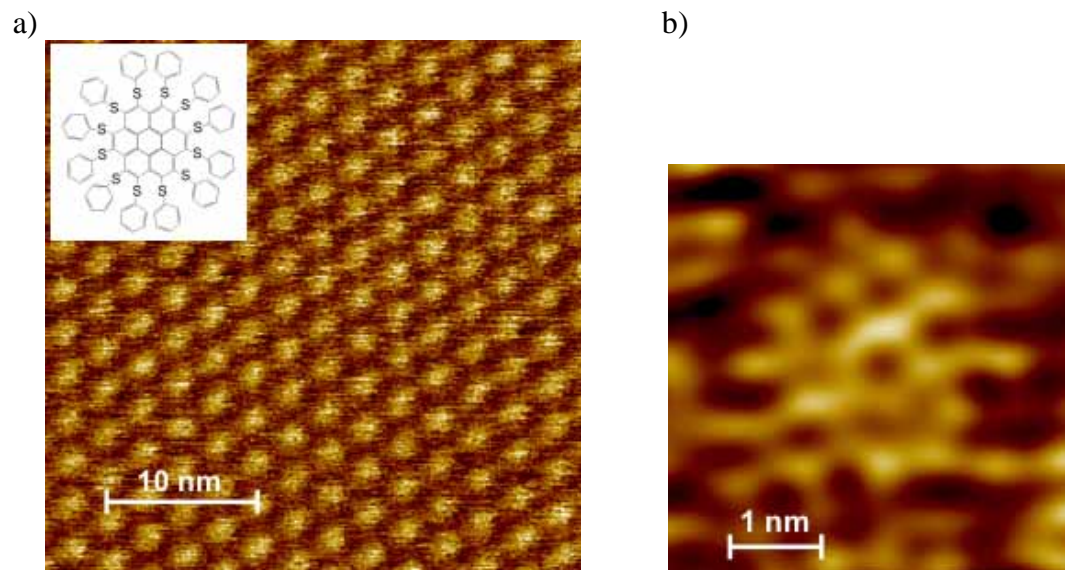
Figures:

Fig. 1 STM images showing a) the hexagonal structure of a self-assembled layer of dodecakis(phenylthio)coronene (inset: chemical structure of the molecule) and b) the molecule in submolecular resolution.