

Supporting information

for

Self-assembly of individually addressable complexes of C₆₀ and phthalocyanines on a metal surface: structural and electronic investigations

Tomas Samuely^{†,†}, Shi-Xia Liu^{‡,}, Marco Haas[‡], Silvio Decurtins[‡], Thomas A. Jung^{§,*}, Meike Stöhr^{‡,*}*

[†] Department of Physics, University of Basel, Klingelbergstrasse 82, 4056 Basel, Switzerland

[‡] Department of Chemistry and Biochemistry, University of Bern, Freiestrasse 3, 3012-Bern, Switzerland

[§] Laboratory for Micro- and Nanostructures, Paul-Scherrer-Institute, 5232 Villigen, Switzerland

[†] present address: Institute of Physics, P. J. Šavárik University, 04001 Košice, Slovak Republic

Experimental part:

The experiments were conducted in a UHV system consisting of different chambers for sample preparation and characterisation (base pressure 10^{-10} mbar). The Ag(111) substrate was prepared by subsequent cycles of sputtering with Ar⁺-ions and annealing at 870 K. All molecules (ZnPc-DTPO and C₆₀) were transferred onto the Ag substrate (kept at 298 K) by sublimation from a Knudsen-cell-type evaporator (Kentax UHV equipment) using a deposition rate of about 0.2 ML/min. The rate was checked with a quartz crystal microbalance. The investigation of the samples was carried out with a commercial LT-STM (Omicron NanoTechnology GmbH) at 77 K. The STM measurements were performed in constant-current mode using PtIr tips. The STS measurements were performed under open feed back loop conditions. For this purpose, the bias voltage is modulated with a small AC voltage and the differential conductivity (dI/dV signal), which is proportional to the local density of states, is obtained with a lock-in amplifier. For our STS experiments only tips clearly capable of resolving the well-known onset for the Ag surface state were chosen since this provides a good reference to assure the cleanliness of the tip and the reproducibility of the experiments. Since the Ag substrate is not covered by a complete monolayer of Pc molecules there are patches of the bare Ag surface left where this check can be done.

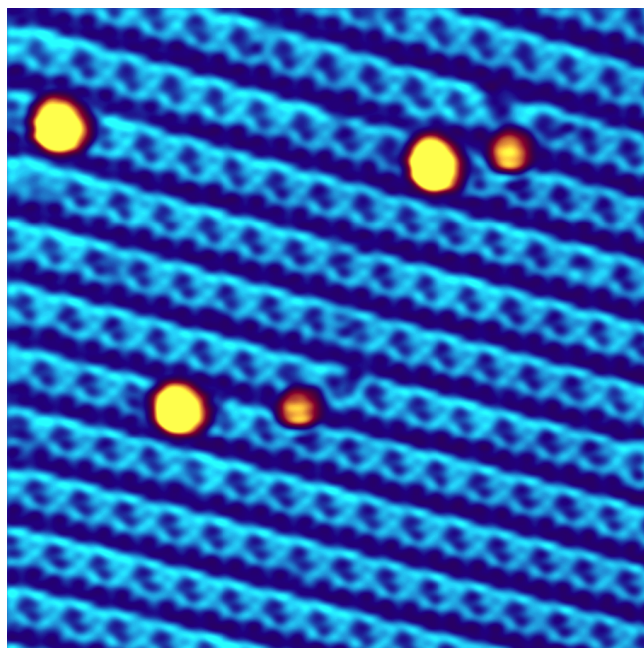


Figure 1: STM image ($25 \times 25 \text{ nm}^2$, 7 pA, 2V) of C_{60} deposited at submonolayer coverage onto an ordered layer of ZnPc-DTPO on Ag(111). Both the imaging and the preparation steps were performed at room temperature under ultrahigh vacuum conditions. Both peripheral and central C_{60} molecules can be identified while no mobility of the C_{60} is observed.

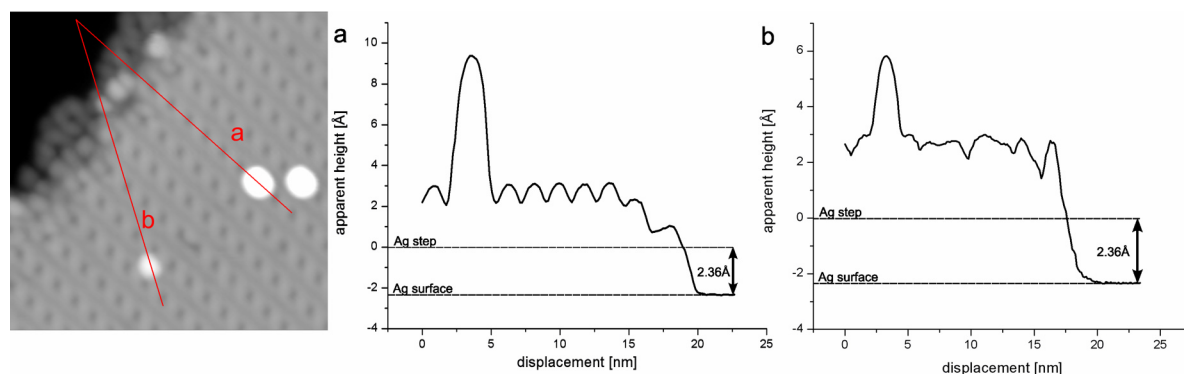


Figure 2: Left: STM image ($25 \times 25 \text{ nm}^2$, 10 pA, -0.5 V, 77K) of C_{60} molecules adsorbed onto an ordered layer of ZnPc-DTPOs. In the upper left corner the clean Ag(111) surface is visible. It is one atomic step (2.36 \AA) lower than the Ag terrace on which the molecules are adsorbed. Right: Height profiles of individual C_{60} molecules, as indicated by the corresponding red lines in the STM image; a) central C_{60} , b) peripheral C_{60} .