Supplemental Material to the article

"Tunneling interferometry and measurements of thickness of ultra-thin metallic films Pb(111)"

Illustrative example of the determination of the Pb-film thickness for system Pb/Si(111)7×7. In addition to the data presented in the main paper we would like to illustrate a procedure of the determination of the local thickness of the Pb-film based on a single map of the differential tunneling conductance. The topographic image in Fig. 1a indicates that there are one developed monoatomic step and one appearing monoatomic step, caused by two screw dislocations, on the *top* surface of the Pb-film. The map of the local differential conductance shown in Fig. 1c points to the additional monoatomic steps on the *bottom* surface of the Pb-film. Thus, one can conclude that there are three regions of different nominal thickness: N_0 (bright areas in Fig. 1c), $N_0 + 1$ (dark areas in Fig. 1c) and close to $N_0 + 2$ (area of the intermediate intensity in Fig. 1c). Taking into account the diagram in Fig. 2a of the main paper, one can conclude that the peak of tunneling conductance at $+0.2$ V should correspond to the Pb-film with $N_0 = 12$. As a consequence, the bright and dark areas in the $dI/dU-$map should be attributed to $N = 12$ and $N = 13$, respectively; while the thickness for the area of the intermediate intensity within the appearing monoatomic step varies from $N = 13$ to $N = 14$ (see labels in Fig. 1c). This conclusion was supported by local STS measurements, which are similar to that shown in Figs. 1f, g of the main paper.

Topography and local tunneling conductance for Pb/HOPG. Typical topographic image of the Pb-islands on top of a cleaved highly-oriented pyrolitic graphite (HOPG) crystal and its cross-sections along the A–B line are presented in Fig. 2a, b. Using the d_{ML} value, one can find the thickness of the thinner island (18 ML) and thicker island (27 ML) with respect to the wetting layer. The local spectra shown in Fig. 2c, d demonstrate the appearance of the well-defined peaks of the tunneling conductance similar to Pb/Si(111)7×7. The corresponding inter-peak intervals ΔE are plotted in Fig. 2b of the main paper.

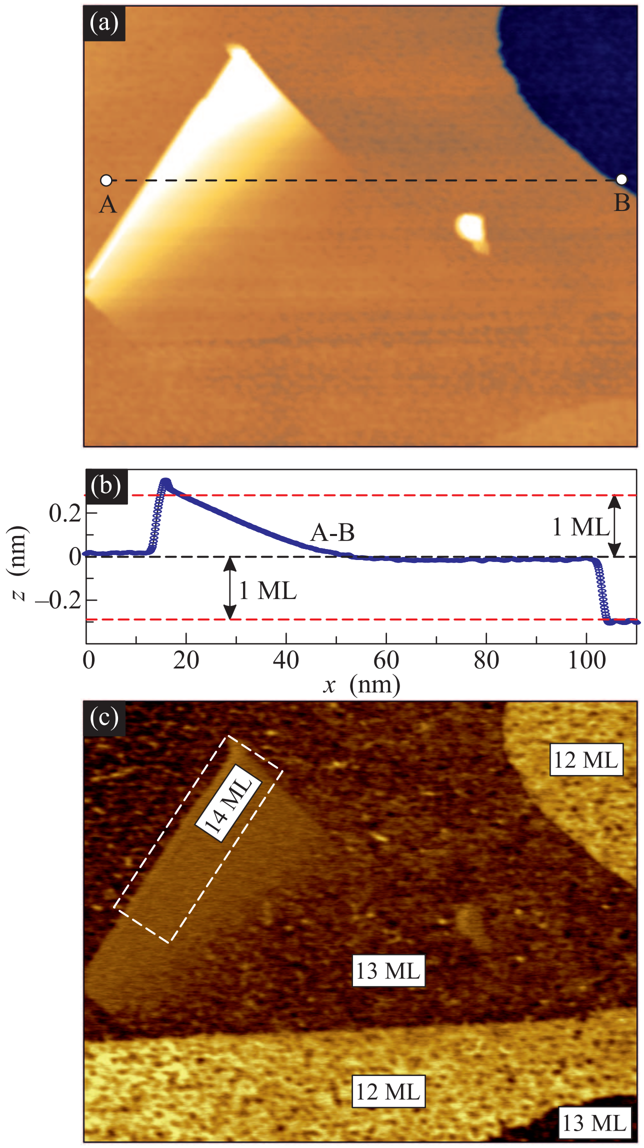

Figure 1: (a) – Topographic STM–image of the surface Pb/Si(111)7×7 with lateral dimensions 115×92 nm, recorded for $U = +0.20$ V and $I = 200$ pA. (b) – The profile along the A–B line. (c) – Map of local differential tunneling conductivity dI/dU recorded for $U = +0.20$ V, I=200 pA, and the amplitude of the bias modulation 50 mV; the labels indicate the local thickness of the Pb-films with respect to the wetting Pb-layer

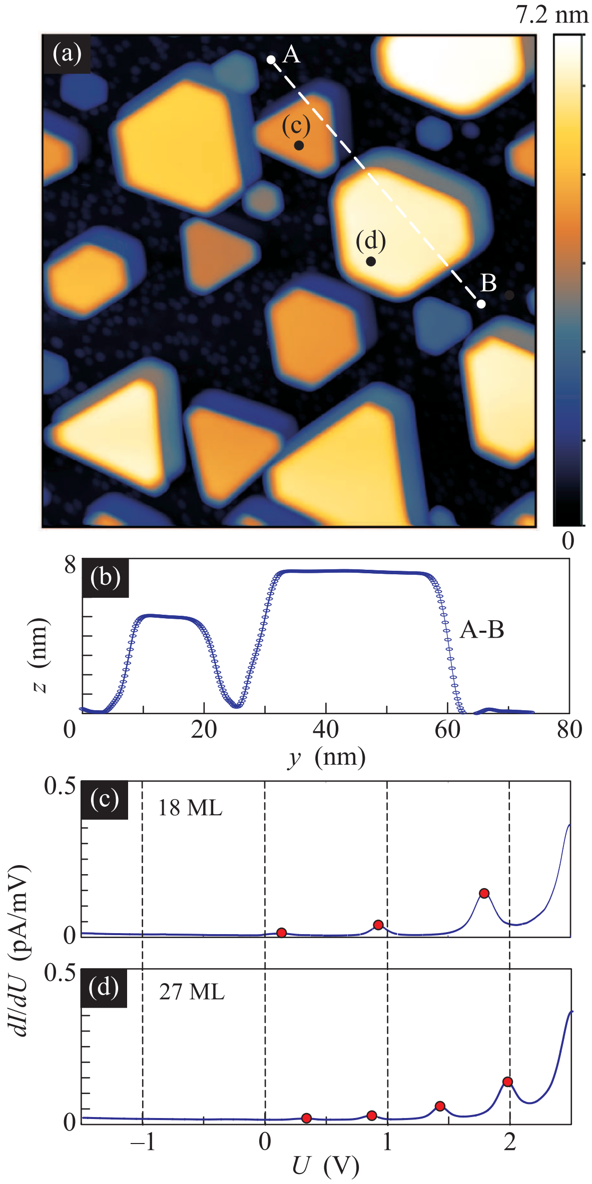

Figure 2: (a) – Topographic STM–image of the surface Pb/HOPG with lateral dimensions 115×115 nm, obtained at $U = +2.50$ V and $I = 100$ pA. Unfortunately, a multiple-apex structure of the STM-tip makes the contours of the thicker Pb nanoislands doubled. (b) – The cross-section of the topographic image along the A–B line. (c)–(d) – Local differential tunneling conductivity dI/dU at the points of the surface, marked in Fig. 2a, of different thickness of the Pb-layer: 18 ML (c) and 27 ML (d); the measurements were carried out at the initial conditions $U = +2.50$ and $I = 100$ pA