

## Supplementary information

### Pulsed Laser Deposition of Single-Layer MoS<sub>2</sub> on Au(111): from Nanosized Crystals to Large-Area Films

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Our PLD method can produce Single-Layer (SL) MoS<sub>2</sub> films over the whole substrate area, of approximately 1 cm<sup>2</sup>. To verify the MoS<sub>2</sub> uniformity over the substrate, we performed STM and Raman measurements in different regions of the sample. We will show here the main results of such measurements, with reference to the MoS<sub>2</sub> film prepared in a single PLD step (see also fig. 9 in the paper). The same considerations about film uniformity apply also for MoS<sub>2</sub> films grown with a multi-step PLD approach.

The 200x200 nm<sup>2</sup> STM images shown in fig. S1 were taken in three different zones of the sample surface: the central region, and two peripheral regions (see the sample scheme in the upper panel of figure S1). The surface morphology shows no significant differences from one region to another: all STM images reveal a uniform SL MoS<sub>2</sub> film covering almost completely (> 0.9 ML) the Au surface.

In addition to STM, we acquired Raman spectra on central and peripheral sample regions. The resulting curves are shown in figure S2 and are remarkably similar between each other. These measurements, together with our STM observations, undoubtedly point to the uniformity of our PLD-grown SL MoS<sub>2</sub> films over an area of approximately 1 cm<sup>2</sup>.

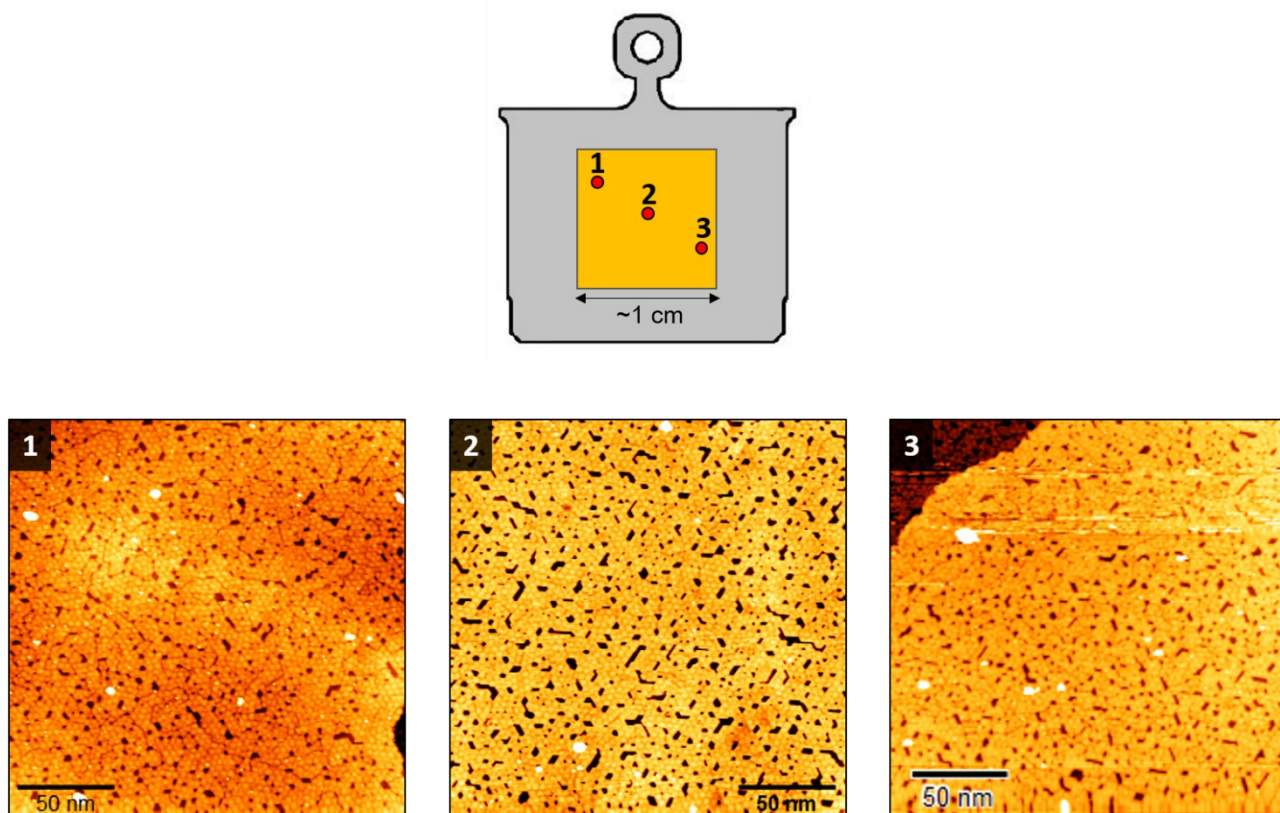


Figure S1: Upper panel: Schematic representation of the sample surface. Labels indicate three different sample regions. Lower panel: 200x200 nm<sup>2</sup> STM images of SL MoS<sub>2</sub> on Au(111) taken on the corresponding sample regions.

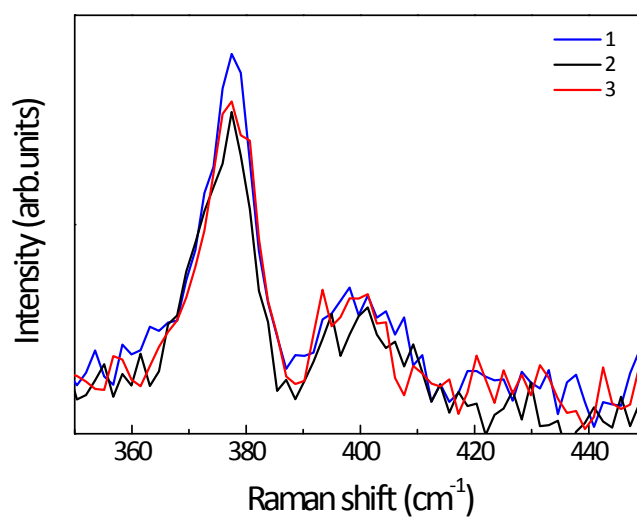


Figure S2: Raman spectra taken on three different sample regions. The curves are labeled according to the sample scheme reported in figure S1.