Experimental Report

Proposal title: Growth properties of ML-thick MoS_2 on Pt(111)
Proposal number: 32-03-742
Beamline: BM32
Shifts: 18
Date(s) of experiment: from: 07 November 2018 to: 13 November 2018
Date of report: 14 February 2020

- Objective & expected results (less than 10 lines): **-**

The *in situ* growth properties of ML-thick transition metal dichalcogenides (TMDCs) such as MoS_2 are barely understood. In this beamtime we planned to address this issue by studying *in situ* and in real-time the structural and morphological evolution of MoS_2 samples grown by MBE on Pt(111) using GIXD and GISAXS. The growth of this new system is currently being developed at CINaM using *in situ* LEEM/PEEM microscopy technique. The expected results included the atomic structure determination of the as-grown samples using the mapping of the reciprocal space along CTRs. We also planned to determine by GIXD the MoS_2 stacking on the substrate. The morphology of the MoS_2 islands (typical island-sizes and inter-island distances) was to be monitored with GISAXS.

- Results and the conclusions of the study (main part): **-**

The Pt(111) surface has been prepared following a well-established procedure including Ar-ion bombardment at room temperature, annealing under O_2 partial pressure (650-700°C) and a final high-temperature flash (>1000°C). The quality of the surface has been confirmed as shown in Fig. 1 by the map of the reciprocal space.

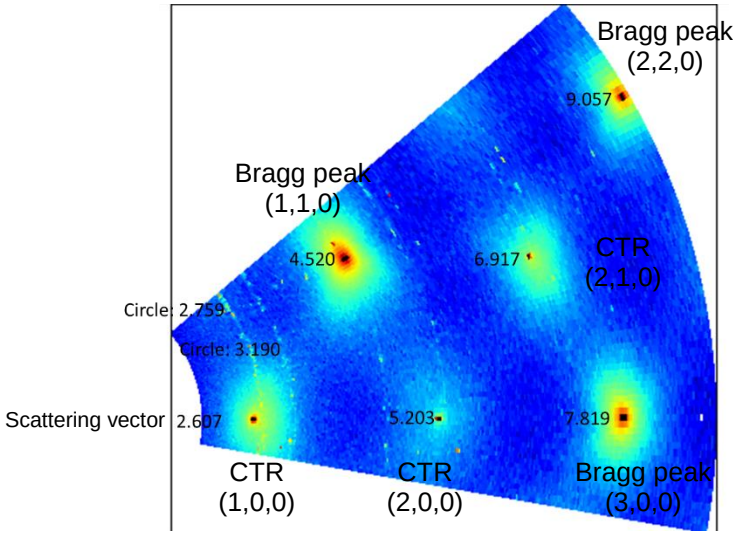

Fig. 1 Reciprocal space mapping of a clean Pt(111) surface in the hk plane at grazing incidence (l=0.06).

The growth of MoS_2 is based on the deposition of Mo by molecular beam epitaxy under H_2S partial pressure. Unfortunately, due to malfunctions of the H_2S gas injection setup during the beamtime, we have not been able to reproduce the growth of MoS_2 layers obtained at CINaM.

- Justification and comments about the use of beam time (5 lines max.): **-**

The preparation of the substrate in the BM32 beamline setup is now validated along with the calibration of the Mo deposition source. Issues with the injection gas system prevented us to elaborate suitable MoS_2 layers.

- Publication(s): **-**

None