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Controlling Source Concentration to Obtain A High Quality Film of Single Layer MoS_2 growth by Chemical Vapor Deposition

Single layer Molybdenum disulfide (MoS_2) has remarkable electronic and optoelectronic properties. Many reports on single layer MoS_2 by Chemical Vapor Deposition (CVD) demonstrate that this low cost production method affords a high reproducibility and that big single crystalline domains can be obtained if the nucleation density is low, which in turn depends on the CVD parameters [1-4].
In this study, we propose an alternative approach to control the MoO_3 vapor by putting the source material in a quartz cup several mm upstream of the substrate. This geometry limits the MoO_3 vapor concentration during the growth process and allows to form a continuous MoS_2 film on the Si/SiO_2 substrate. The samples were characterized by scanning electron, atomic force and transmission electron microscopy for what concerns the structure and morphology, and by Raman, photoluminescence, and X-ray photoelectron spectroscopy to learn about composition and electronic structure. Moreover the MoS_2 were used as active material in a field effect transistor to confirm the quality of the sample in terms of defects.

References

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Figures

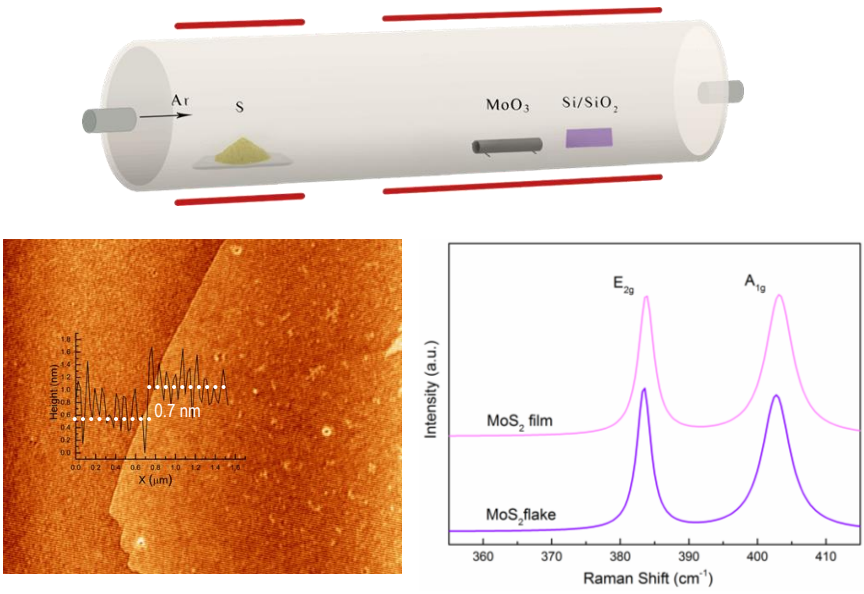

Figure 1: (a) An illustration of the CVD set up. (b) Phase-mode AFM image of single layer MoS_2. (c) Raman Spectra of a MoS_2 flake and a continuous film.