Thin MoS_2 layer grown on SiO_2 by CVD method

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Abstract

The Transition metal dichalcogenides (TMD), MX_2 (M=Mo, W; X=S, Se, Te), inorganic graphene analogues, have attracted substantial attention due their great potential in various fields as catalysis, nanotribology, microelectronics, lithium batteries, hydrogen storage, medical and optoelectronics [1]. Especially MoS_2 due to the direct gap, that presents the monolayer, promises applications in optoelectronics.

Substantial efforts have been addressed to growing of thin-layer MoS_2, using various methods including scotch tape based micromechanical exfoliation and, chemical exfoliation of bulk material, chemical vapor deposition (CVD), among other techniques [2].

In this work, CVD method was used to explore the growing of thin MoS_2 layer. MoS_2 (mono and few layer) was grown directly on SiO_2/Si substrates using MoO_3 powder. By optical microscopy was possible to identify MoS_2 layer-regions based on the optical contrast. Raman spectroscopy (laser λ=532 nm) analysis showed two typical active modes: E^1_{2g} and A_{1g} [3]. These modes of vibration have been investigated both theoretically and empirically in MoS_2 bulk. E^1_{2g} mode indicates planar vibration and A_{1g} mode is associated with the vibration of sulfides in the out-of-plane direction. Raman peak position of v E^1_{2g} and A_{1g} was used in order identify the thickness of the layers[3]. The peaks were found to be blue-shift for E^1_{2g} and red-shift for A_{1g} when it compared mono layer with MoS_2 bulk.

References

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Figures

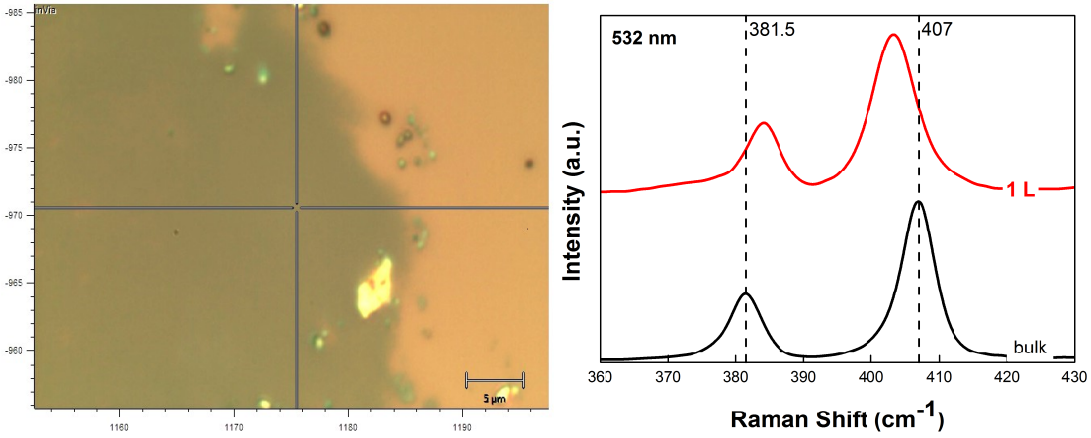

Figure 1. Optical image of thin MoS_2 film onto SiO_2/Si substrate and Raman spectrum for bulk and mono-layer MoS_2 (laser λ=532 nm).

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