CVD growth of 2 dimensional MoS_2 and heterostructures with graphene

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Abstract

Vapour deposition techniques have gained a lot of interest for growth of two dimensional (2D) materials[1-4]. In the recent past there has been a surge in the number of researchers studying atomic planes of other Van der Waals solids and heterostructures created by stacking layers with complementary characteristics to achieve novel functionality [5]. For successful scaling up of prototypical applications demonstrated to date, technologies and processes for large area deposition of these materials need to be developed. Here we present the technology employed and study of the impact of process parameters on a chemical vapour deposition (CVD) process for the production of single-layer MoS_2 using a gas-phase S precursor (H_2S) and solid Mo precursor ($MoCl_5$). Strategies for optimising crystalline quality via direct control of deposition variables and the impact of process parameters on defect density is analysed qualitatively using Raman spectroscopy [6]. We also present the characteristics of CVD grown MoS_2 on different substrates and investigate the use of graphene as a substrate for MoS_2 growth which opens an avenue for growth of 2D heterostructures.

References

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Figures

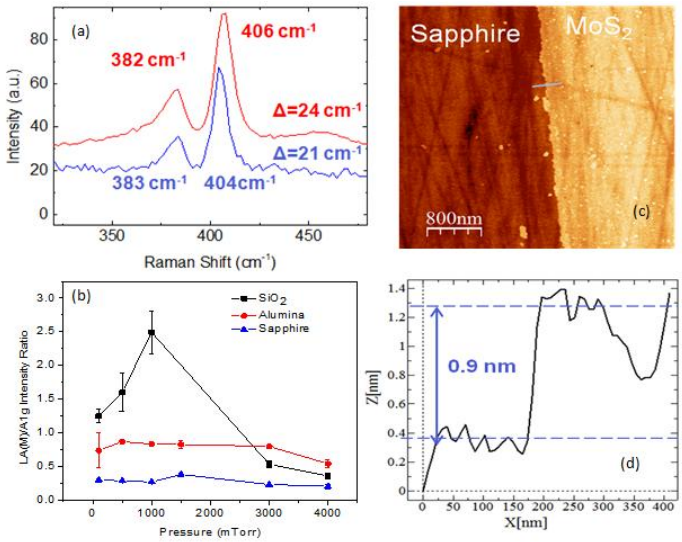

Figure1 (a) Raman spectrum of CVD deposited MoS2 (b) LA(M)/A1g peak ratio of deposited MoS2 on different substrates. (C),(d) AFM analysis of obtained films