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Influence of sulfurization temperature on the growth of MoS₂ thin films

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Keywords: Molybdenum disulfide, carbon disulfide, spin coating.

In this work, molybdenum disulfide (MoS₂) thin film was successfully deposited by using thermal vapour sulfurization method with spin coating as pre-deposition technique. The availability of solvent for dissolution process of molybdenum (Mo) and sulfur (S) sources is rare. Single source precursor (SSP) was the common starting source for the preparation of precursor solution. However, hazardous solvent was required to dissolve the SSP. An alternative, dual source precursor (DSP) approach, was applied in this study. Thereafter, sulfurization process was imposed as to transform the deposited MoS-based films to MoS₂ thin films. Carbon disulfide was used as the sulfurization source due to the lower decomposition rate as compared to conventional S powder. The homogeneity and compactness of MoS₂ were improved when sulfurization temperature increases. Yet, rod-like feature was observed at much higher temperature. Next, the absorption features of MoS₂ were detected at 667 nm, 617 nm and 447 nm. Resonant Raman spectroscopy showed the multiphonon and second order vibrational modes of MoS₂. Also, multilayers of MoS₂ was estimated by frequency difference of E_{12g}(Γ) and A_{1g}(Γ) modes. This observation was further confirm by the high resolution transmission electron microscopy.