

# Influence of initial sulfur content in precursor solution for the growth of molybdenum disulfide

A L Tan<sup>1,2</sup>, S S Ng<sup>2</sup>, and H Abu Hassan<sup>1,2</sup>

<sup>1</sup> School of Physics, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia.

<sup>2</sup> Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia, 11800 USM, Penang, Malaysia.

E-mail: elwinharrisontan92@gmail.com

**Abstract.** This work investigated the influence of initial sulfur content in the precursor solution for the growth of molybdenum disulfide (MoS<sub>2</sub>) films by thermal vapour sulfurization (TVS) with sol-gel spin coating as pre-deposition technique. The early introduction of sulfur shows the presence of grains are uniformly distributed and homogeneous on the surface of the film. MoS<sub>2</sub> (002) planes are detected for both films with and without initial sulfur conditions, however, the presence of initial sulfur contents gives slightly higher intensity of diffraction peak. Two phonon modes for MoS<sub>2</sub>, namely the E<sub>2g</sub><sup>1</sup> (in-plane) and the A<sub>1g</sub> (out-of plane), are well detected from which the frequency difference of Raman peaks between E<sub>2g</sub><sup>1</sup> and A<sub>1g</sub> suggest the grown MoS<sub>2</sub> consisted of multi-layers. There is a slight shift of E<sub>2g</sub><sup>1</sup> which is caused by the carbon impurities but no shift for A<sub>1g</sub>. Besides, MoS<sub>2</sub> film with the presence of initial sulfur content shows better crystal as indicated by its narrower Raman peaks linewidth. Two broad absorption peaks of MoS<sub>2</sub> are detected at 614nm and 665nm. Hence, the early introduction of sulfur content in prepared precursor solution is one way of optimizing the growth of MoS<sub>2</sub> films.