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Title of the Presentation: Layer Controlled Growth of MoS₂ thin film through MOCVD

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Short Biography:

Woonggi Hong received his B.S. degree and M.S. degree in Electrical Engineering from Korea University and KAIST in 2015 and 2017, respectively. Now, he is a Ph.D. candidate at KAIST under the supervision of Prof. Sung-Yool Choi. His research interest is mainly focused on the synthesis of MoS₂ thin film with high-quality and its electronic applications.

Abstract:

Two-dimensional materials, especially TMDs, have attracted a lot of attention for their superior electrical and optical properties in the fields of electronics, optics, and optoelectronics. Unlike bulk materials, TMDs makes up the layer stacked structure by van der Waals (vdW) force.[1] Due to this unusual layer stacked structure, TMDs shows the layer dependent electrical and optical properties. Although TMDs shows the unique properties in accordance with the number of layers, it still remains to control the number of layers of TMDs through growth process. In this study, we report the layer controlled growth of TMDs (especially MoS₂) through metal-organic chemical vapour deposition (MOCVD). [2] With careful adjustment of precursor ratio, partial pressure, and growth time, we successfully synthesized MoS₂ thin film ranging from 1 layer to 5 layers. In order to confirm the successful layer control of MoS₂, we analyzed MOCVD-grown MoS₂ thin films using a variety of tools such as photoluminescence (PL), Raman spectroscopy, differential reflectance spectroscopy (DRS), and field effect transistors (FETs). Combining the results from DRS and PL, we also confirmed the evolution of electronic structure in band diagram as increasing the number of layers. Finally, we also investigated the electrical performance as a function of the number of layers of MoS₂ channel in terms of resistance, threshold voltage, and mobility.

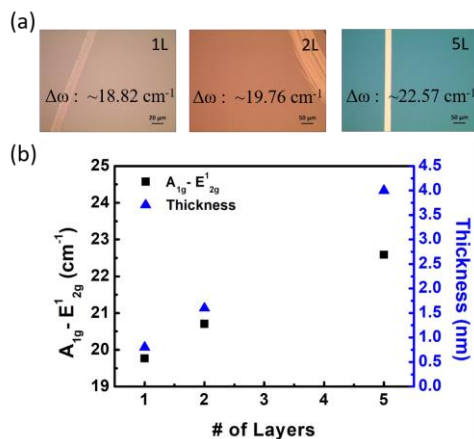


Figure 1. (a) Representative OM images of MoS₂ and (b) their thickness plot measured by AFM and Raman spectroscopy.

[1] A. K. Geim et al., Nature, 499, 419 (2013)

[2] K. Kang et al., Nature. 520, 656 (2015).