Wafer-Scale Growth and Integration of Two-Dimensional Transition Metal Dichalcogenides

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So far, two-dimensional (2D) transition metal dichalcogenides (TMDs) have received great attention, because the isolated 2D TMDs exhibited unusual properties different from their bulk counterparts. In particular, MoS_2 is in focus of the current research of 2D materials, due to the interesting properties including high optical responsivity, strong light-matter coupling, and efficient valley-selective optical transition. Using these properties, researchers have presented various applications ranging from electronics and optoelectronics, sensors and membranes, to heterogeneous catalysts.
In order to realize its potential for these applications, it is important to produce monolayer-MoS_2 in large scale, with spatial homogeneity. Many synthetic strategies have been introduced, including sulfurization of Mo metal , evaporation of MoO_3 in S atmosphere, and metal organic chemical vapor deposition (MOCVD) using gas-phase precursors. Among them, MOCVD using gas-phase precursors is particularly promising for the realization of wafer-scale films, owing to the uniform and precisely controlled supply of precursors over the entire substrate.
In this talk, we present the growth of 6-inch wafer-scale monolayer-MoS_2 on SiO_2 via MOCVD technique. No catalytic materials as well as seeding promoters were used for preventing contamination. Film quality and spatial homogeneity were guaranteed by Raman and PL measurements. Uniform, continuous film was observed in the whole wafer. The electrical properties and triboelectric charging characteristics of our MoS_2 were investigated [1].

References

[1] M. Seol, S. Kim, Y. Cho, K.-E. Byun, H. Kim, J. Kim, S.K. Kim, S.-W. Kim, H.-J. Shin, S. Park, Adv. Mater. 30 (2018) 1801210