Toward large-area 2D electronics

Ki Kang Kim[1]

Presenting Author

Soo Min Kim[2]

[1]Department of Energy and Materials Engineering, Dongguk University-Seoul, Seoul 04620, Republic of Korea
[2]Institute of Advanced Composite Materials, Korea Institute of Science and Technology (KIST), San101 Eunha-Ri, Bongdong-Eup, Wanju-Gun, Jeollabuk-Do, 565-902, Republic of Korea
Contact@E-mail
kkkim@dongguk.edu

Abstract

Realizing large-area two-dimensional (2D) electronics requires high-quality and large-area 2D materials. This presentation presents the growth strategies for large-area 2D semiconductors and insulating materials (molybdenum disulfide, tungsten disulfide, hexagonal boron nitride, etc.) by chemical vapor deposition [1-3]. Moreover, we introduce new precursors to obtain large-area 2D materials as well as propose related growth mechanisms. It also introduces new methods for large-area 2D heterostructures with clean interfaces between 2D layers. Finally, we demonstrate a large area 2D electronic device built with conventional photolithography. We believe our approach not only opens the way to synthesis other 2D materials, but also develops industry applications.

References

[1] S. M. Kim *et al.*, Nature Communications, 6 (2015) 8662
[2] S. J. Yun *et al.*, ACS Nano, 9 (2015) 5510
[3] S. H. Choi et al. revised in Sci. Rep. (2017)

Figures

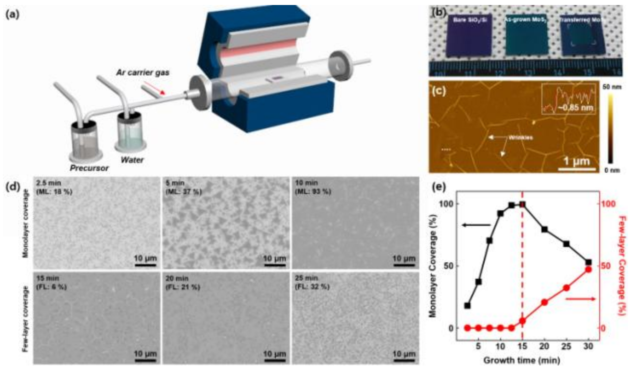

Figure 1: Synthesis of MoS_2 film. (a) Schematic illustration of the CVD system with a liquid precursor and water bubblers. The bubblers are connected with individual mass flow controllers. (b) Photographs of the bare SiO_2/Si substrate, as-grown MoS_2 film, and transferred MoS_2 film. (c) Atomic force microscopy image of the transferred MoS_2 film. The inset indicates the height profile along the dotted white line. The white arrows present the MoS_2 wrinkles. (d) SEM images of as-grown MoS_2 as a function of the growth time. The dark region indicates MoS_2 and the white background indicates the SiO_2/Si substrate. The coverage for monolayer (ML) and few-layer (FL) MoS_2 is displayed in each SEM image. (e) The coverage for monolayer (black) and few-layer (red) MoS_2 regions as a function of the growth time.