New Perspectives in Atomic Layer Deposition Technique for 2D Material Thinfilm Deposition and Thinfilm Deposition on 2D Materials

Woojin Jeon
Department of Advanced Materials Engineering for Information and Electronics,
Kyung Hee University, Korea
E-mail: woojin.jeon@khu.ac.kr

2D materials has attracted significant attention for the future electronics as a promising alternative material to Si or graphene, owing to its excellent properties. For demonstrating the actual electronic applications employing the 2D material, it is highly recommended that the implementation of compatibility with conventional Si-based process. Thus, the development of a technique enabling reliable and rapid preparation in large area for 2D materials deposition itself as well as deposition of various kinds of functional thinfilm on the 2D material is very important.

Atomic layer deposition (ALD) technique is the most promising deposition technique to fulfill these requirements. The self-limiting nature of the growth process in ALD allows atomic-thickness controllability, low growth temperature, and its applicability to deposit uniform films on 3D structures, resulting an important thin-film growth method used in various applications. However, this nature of ALD, which enables its advantages, induces inevitable drawbacks in developing 2D material deposition technique and thinfilm deposition technique on 2D materials by employing ALD. Relatively low process temperature of ALD is unfavorable to demonstrating high crystallinity in 2D material deposition. Chemically inert surface of 2D materials inherently obstructs the integration with various functional thinfilms using ALD.

Herein, I introduce new ALD techniques as novel methods to overcome limitations of conventional ALD on 2D material-related applications; inhibitor-utilizing ALD and physisorbed-precursor-assisted ALD. The new ALD processes presented here provides new prospects for a low-temperature, large-scale 2D material synthesis technique and integrating with various thinfilms, enabling a new era in electronics.

References [1] Adv. Mater. 29, 1703031 (2017). [2] ACS Nano 10, 6659 (2016). [3] 2D Materials 3, 035027 (2016).