Department of Advanced Design and Systems Engineering

香港城市大學
City University of Hong Kong

Exploring Two-Dimensional Materials for Future Electronic Devices

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Abstract

Due to our life style changes, data created exponentially and continuously increases. To respond to the huge Data created, cconventional Si device scaling down for angstrom era, and 3D stacking device and introduction of disruptive device should be considered. However, the process technology and material performance of Si devices are gradually reaching their limits, and the development of new materials, processes and device architectures is required to overcome these limitations. Graphene and 2D Materials have an ultra-thin crystal structure with a stable surface state. For example, among diverse 2D materials, MoS2 has a great potential in logic transistor because of its high mobility, and no short channel effect. This is a great opportunity to go into the angstrom era. In this talk, we will introduce 2D material designs from growth to integration via interface property control to go into the Angstrom era: (i) material growth for wafer-scale and precise layer control, (ii) interface control for doping, adhesion, and contact resistance, (iii) multi-stacking device with a low resistance metal barrier, ultralow dielectric material. Finally, we will briefly discuss future computing systems such as low-power synaptic device that are going forward.

About the Speaker

Hyeon-Jin Shin, Ph.D. is a “Research Master” in the field of graphene and 2D materials at Samsung Advanced Institute of Technology (SAIT), Samsung Electronics. She has been researched 4 main topics at SAIT. Since 2002, she has developed ultra-low-dielectric materials for logic interconnect by the synthesis of silsesquoxane polymers. Since 2007, she has researched nano-carbon based materials such as carbon nanotube and graphene for transparent electrodes by chemical doping. Since 2009, she has expanded her research area to 2D materials for future electronic devices. In addition to that, she explored energy harvesting devices using various 2D materials (2016~2018). From 2021, she is working on ultra-low-dielectric material again using amorphous-BN, a deformed 2D material. She is the project leader of the ultralow-k team.

She received B.S. degree in Chemistry from Kongju National University (2000). She received M.S. degree in Chemistry from Korea University (2002). After that, she joined SAIT. While working at SAIT, she received Ph.D in nano science from Sungkyunkwan University (2010). Her thesis topic was “electronic structure modulations of nano-carbon based materials by chemical doping for electronic device”. She has published over 86 articles, which received over 8138 citations (h-index of 37). She also has been filled over 200 US patents.

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