In-Person Departmental Colloquium

Department of Materials Science and Chemical Engineering

Wednesday
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1:00 – 2:00 p.m.

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Vapor-Phase Infiltration for Energy-Efficient, Extremely Downscaled Semiconductor Devices

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Abstract

Semiconductors are the brains of modern electronics, from simple calculators to smartphones we depend on every day, and to supercomputers that predict complex weather patterns. Literally, human society would not function without them. Communications, computing, health care, military systems, transportation, clean energy, and countless other applications all are enabled by semiconductors. However, semiconductor technologies are facing unprecedented energy challenges. Ever increasing demand for high performance and bandwidth in electronics is predicted to consume about 30% of the total human planetary energy production by 2035, which is impossible to sustain. To address this, there needs to be fundamental paradigm shift in electronics architecture as well as continuing extreme downscaling of semiconductors devices beyond Moore's law. In this talk, I will showcase our recent efforts to address these challenges by utilizing vapor-phase infiltration (VPI), an organic-inorganic hybridization method derived from atomic layer deposition (ALD). Specifically, I will discuss the VPI applications to extreme ultraviolet (EUV) lithography patterning towards sub-3 nm node semiconductor chips and brain-inspired neuromorphic memory devices. I will also briefly mention opportunities for Ph.D. thesis research available in my group.

Biosketch

Dr. Chang-Yong Nam is a Scientist at the Center for Functional Nanomaterials of Brookhaven National Laboratory (BNL), and an Adjunct Professor of Materials Science and Chemical Engineering at Stony Brook University. Dr. Nam received his Ph.D. in Materials Science and Engineering from the University of Pennsylvania (2007), M.S. in Materials Science and Engineering from KAIST (2001). and B.E. in Metallurgical Engineering from Korea University (1999). Dr. Nam's research is focused on two primary areas: (a) Development of ALD methods towards microelectronics and energy applications; (b) Materials processing and device physics in low-dimensional semiconductors. His awards include Battelle Inventor of the Year (2022), Winner of DOE National Labs Accelerator Pitch Event (2021), BNL Spotlight Awards (2022, 2018, 2011), and Goldhaber Distinguished Fellowship (2007).