Polymer Seminar

11:15 am, November 7, 2025

Science 1 - room 1002

Host: Puxian Gao

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Chang-Yong Nam

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Brookhaven National Laboratory

Vapor-Phase Infiltration for Novel Organic-Inorganic Hybrid Synthesis and Advanced Patterning Applications

Abstract: Vapor-phase infiltration (VPI), also known as sequential infiltration synthesis (SIS), involves the sequential and cyclic infiltration of gaseous organometallic precursors and co-reactants into the matrix of organic templates to form inorganic-infused organic-inorganic hybrids with uniquely modified compositions, properties, and structures. In this talk, I will provide an overview of our efforts in employing VPI of metal oxides for novel patterning applications based on various polymeric templates, such as self-assembled block copolymers (BCPs) and photoresists. Precursor-polymer reaction chemistry will be discussed in relation to infiltration fidelity, area selectivity, material distribution, and volume expansion, which impact target material functionalities and applications. These include BCP-based metal oxide nanostructure patterning, hybrid nanocomposites with extremely high capacity for elastic energy storage, and the vapor-phase synthesis of hybrid extreme ultraviolet (EUV) photoresists for angstrom-era semiconductor scaling in the next decades.

Bio: Dr. Chang-Yong Nam is Senior Scientist and the Group Leader of the Electronic Nanomaterials Group at the Center for Functional Nanomaterials (CFN) of Brookhaven National Laboratory (BNL), and an Adjunct Professor of Materials Science and Engineering at Stony Brook University and University of Texas at Dallas. He also currently serves as the Lead PI of an $8M DOE Accelerate Initiative project entitled “Angstrom Era Semiconductor Patterning Material Development Accelerator.” Before joining BNL in 2007, 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 (Korea Advanced Institute of Science and Technology) (2001). and B.E. in Metallurgical Engineering from Korea University (1999). Dr. Nam’s research is focused on two primary areas: (a) Development of atomic layer processing (ALP) methods, including atomic layer deposition (ALD), atomic layer etching (ALE), and derivative techniques, towards microelectronics and energy applications; (b) Materials processing and device physics in low-dimensional semiconductors and neuromorphic materials. His awards include BNL Science and Technology Award (2024), Battelle Inventor of the Year (2022), Winner of DOE National Labs Accelerator Pitch Event (2021), BNL Spotlight Awards (2022, 2018, 2011), and BNL Goldhaber Distinguished Fellowship (2007).

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