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Materials Science and Engineering

Synthesis at Confined Heterointerfaces

Zakaria Y. Al Balushi, Assistant Professor, University of California, Berkeley

Monday, April 24, 2023
4:00 – 5:00 PM
Thurston 205

ABSTRACT: Some of the unique attributes of chemical synthesis in confined spaces is that chemical reactions can be regulated by the interface physics and chemistry. Such attributes include the interfacial energy landscape, the nature of bonds and lattice mismatch between the heterointerface layers. Each will play a role in the final resulting structure of the confined material, making the heterointerface a unique design space for synthetic chemistry of crystalline solids. In this talk, I will discuss examples from my group on the use of such heterointerfaces to stabilize atomically thin forms of conventional solids by intercalating, precipitating, or transforming chemical species at the heterointerface of graphene. Confining chemical reactions to such heterointerfaces will offer foundational guidance that will undoubtably enable many discoveries in materials structure-property-functionality to come.

BIO: Prof. Al Balushi is an assistant professor in the department of Materials Science and Engineering at University of California, Berkeley, and a faculty scientist in the Materials Science Division at the Lawrence Berkeley National Laboratory. Zakaria received his B.S. (2011), M.S. (2012) in Engineering Science and his Ph.D. (2017) in Materials Science and Engineering all from The Pennsylvania State University. His early work focused on integration and fabrication of silicon nanowire devices, then on the growth of group-III nitride semiconductors, *in* situ metrology during MOCVD growth, epitaxial graphene and the discovery and characterization of unconventional low-dimensional materials and heterostructures. Prior to his appointment at the University of California, Berkeley, he held two postdoctoral fellowships: the Resnick Prize Fellowship in Applied Physics and Materials Science and the NSF Alliances for Graduate Education and the Professoriate (AGEP) Fellowship both at the California Institute of Technology under the supervision of Professor Harry Atwater. At Caltech, he focused on the synthesis and characterization of phase transformations in transition metal dichalcogenides 2D materials. At the University of California, Berkeley, his research group continues to expand in this area and beyond, creating new synthesis and integration schemes for emerging low-dimensional materials. He is currently serving on the editorial board of Communications Materials, is a Principal Editor for Journal of Materials Research, an elected executive committee member for the American Association for Crystal Growth and recently named “Four rising stars who are reshaping nanoscience” by Nature [*Nature 608, S12-S13 (2022)*]. He is also a SK Hynix Faculty Fellow, Society of Hellman Fellow, a CIFAR Azrieli Global Scholar in Quantum Materials and a recipient of the NSF CAREER and Micron Corporation Early Career Awards in 2022.