

UNIVERSITY OF CALIFORNIA, IRVINE

THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Is Proud to Host a Seminar by:

PROFESSOR JUDY J. CHA

Dept. of Materials Science and Engineering
Cornell University

Thursday, September 22, 2022

2:00-3:20 PM

Zoom Meeting ID: 928 5767 0106, Passcode: 541893

NANOSCALE PHASE TRANSFORMATION USING IN SITU TEM

Abstract: We encounter and utilize phase transformations daily in our lives: from rain to snow in winter to non-volatile phase change memory in computing. At the nanoscale, phase transformations deviate from those at the macroscale, providing opportunities to control phase transformations and thus the microstructures and properties of nanoscale systems.

Here, we employ *in situ* transmission electron microscopy (TEM) to study how phase transformations emerge, deviate, and are controlled at the nanoscale upon electrical biasing, heating, and cooling, and examine their effects on materials properties.

I will discuss several examples of nanoscale phase transformations: IBM's confined phase change memory cells that achieved record endurance, metallic glass nanostructures that test the limits of classical nucleation theories, ferroelectric transition of topological crystalline insulator SnTe nanowires, and charge density waves in layered materials. In all these examples, *in situ* TEM investigations reveal detailed and unexpected phenomena and rich structural and chemical heterogeneities, guiding us to build better models and theories for nanoscale phase transformations.

Bio: Judy J. Cha is a Professor in the Department of Materials Science and Engineering at Cornell University. She received her Ph.D. in Applied Physics from Cornell University in 2009 and did her post-doc research at Stanford University in the Department of Materials Science and Engineering. Before joining Cornell in 2022, she was a faculty member in the Dept. of Mechanical Engineering and Materials Science at Yale University. She is a recipient of the SRC Young Faculty Award (2021), the Gordon & Betty Moore EPIQS Synthesis Investigator Award (2019), the NSF CAREER (2018), the Canadian Institute for Advanced Research (CIFAR) Azrieli Global Scholar for quantum materials (2017), the Yale Arthur Greer Memorial Prize (2016), and the IBM Faculty Award (2014).