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In Situ Nanomechanics

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ABSTRACT:

In situ nanomechanics is an emerging field that investigates the mechanical properties and deformation mechanisms of nanostructured materials. The study of in situ nanomechanics is typically conducted by integrating the real-time mechanical testing inside an electron microscope and the mechanics modeling with atomic resolution. It provides a powerful approach to visualize the intrinsic nanomechanical behavior of materials - seeing is believing. In this talk, I will present recent studies of in situ nanomechanics from my group, including the electrode degradation in nanoscale lithium-ion batteries (Nature Nanotechnology, 7, 749, 2012); deformation-induced stacking fault tetrahedra in FCC nanocrystals (Nature Communications, 4, 2340, 2013); fracture toughness of graphene (Nature Communications, 5, 3782, 2014); and twinning-dominated deformation in BCC nanowires (Nature Materials, 14, 594, 2015). The in situ nanomechanics studies provide new insights that cannot be offered by traditional mechanics studies. Ultimately, the in situ nanomechanics research aims to enable the design of nanostructured materials to realize their latent mechanical strength to the full. Our research involves collaborations with Drs. Scott Mao, Jianyu Huang and Jun Lou.

BIOGRAPHY:

Ting Zhu is a professor and a Woodruff Faculty Fellow in the George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology. He received his Ph.D. in Mechanical Engineering from Massachusetts Institute of Technology in 2004. He worked as a postdoctoral associate at Harvard University, before joining Georgia Tech in 2005. His research is focused on mechanics and materials modeling. Zhu is an ASME Fellow. He receives the ASME Sia Nemat-Nasser Early Career Award in 2013 and the Young Investigator Medal from the Society of Engineering Science (SES) in 2014.