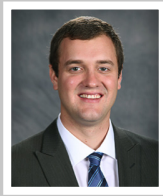
NANOMATERIALS SPEAKER SERIES

LITHIUM-ION BATTERIES: DIFFUSION, DEFORMATION AND DAMAGE

December 2, 2016 at 12:30pm

Engineering Building 2, Rm W122

In lithium-ion batteries, electrochemical driving forces promote mass transport and stimulate chemical interactions. As atoms move and rearrange, the material deforms, thereby generating stresses. These stresses can result in fracture of the electrodes, diminishing the capacity of the battery. Meanwhile, the stresses alter the total chemical potential, and can accordingly influence mass transport and even shut off chemical reactions entirely. In this presentation, I will discuss the importance of such interplay in high-capacity lithium-ion battery electrodes. I will focus primarily on silicon anodes, which have enormous theoretical storage capacities but have achieved little success in practice due to fracture during cycling. Our theories and experiments reveal the essential conditions required to prevent fracture and thus pave the way toward realizing new high-capacity batteries. Time permitting, I will also discuss my work on mechanical designs that mitigate damage in stretchable electronic devices.



Matt Pharr

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SPEAKER BIO

Matt Pharr is an assistant professor in mechanical engineering at Texas A&M University (courtesy appointment in materials science and engineering). He received his Ph.D. at Harvard University under the guidance of Prof. Zhigang Suo and Prof. Joost Vlassak and did a postdoc at the University of Illinois at Urbana-Champaign with Prof. John Rogers. His current research interests include materials for energy storage and conversion, deformation and fracture of soft materials, mechanics of stretchable electronics, coupled electro-chemo-mechanics, and mass transport in materials.

Contact Professor Cunjiang Yu at cyu13@central.uh.edu if you would like to arrange for a time to meet with Dr. Pharr.

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