

**Department of Electrical and Computer Engineering  
Texas Center for Superconductivity  
Materials Engineering Program  
Center for Integrated Bio and Nano Systems  
10:00 a.m., April 30, 2021**

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**Mechanics of Materials for High-Capacity Rechargeable  
Batteries**

**Matt Pharr**

Texas A&M University

**Abstract:** Despite their prevalence, rechargeable batteries currently utilize materials with relatively low energy densities that add substantial weight and volume to vehicles and portable electronics. Recently, several high-capacity electrodes have been identified, but these materials suffer from severe issues of cyclability and safety that have precluded their practical use. While the electrochemistry of these systems has received extensive study, at the heart of many issues lies a mechanics of materials problem: as atoms rearrange under electrochemical driving forces, the material deforms, thereby generating stresses under constraint. These stresses can result in fracture, detachment, and/or unstable deformation of the electrodes, diminishing their capacity. In this talk, I will discuss our recent experimental research aimed at basic understanding of mechanical behavior of several high-capacity battery electrodes.



**Short Bio:** Matt Pharr is an Assistant Professor and J. Mike Walker '66 Faculty Fellow in Mechanical Engineering at Texas A&M University with a courtesy appointment in Materials Science & Engineering. He received his Ph.D. from Harvard University and performed postdoctoral research at the University of Illinois at Urbana-Champaign. His research focuses on mechanics of materials in areas including energy storage and conversion, soft materials, irradiated materials, stretchable electronics, coupled electro-chemo-mechanics, and materials for neuromorphic computing. He has received the NSF CAREER Award, the Kaneka Junior Faculty

Award, the Peggy L. & Charles Brittan '65 Outstanding Undergraduate Teaching Award, and the Montague-Center for Teaching Excellence Scholar Award.

Please contact Prof. Yan Yao<[yyao4@Central.UH.EDU](mailto:yyao4@Central.UH.EDU)> or Prof. Jiming Bao ([jbao@uh.edu](mailto:jbao@uh.edu)) if you want to meet with the speaker.