Multiphysics behaviors of battery safety issues

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Abstract

Internal short circuits and thermal runaways are typical battery safety issues where electrochemistry, thermal, and mechanics are strongly coupled. Interdisciplinary endeavors are in pressing need to address these safety issues, enabling wider application and further improvement for lithium-ion batteries. Physics-based multiphysics modeling provides us a mechanistic understanding of the nature of battery safety. In this talk, I will give an organic overview of our research work on the multiphysics modeling of lithium-ion battery issues from the particle level to cell level in the past few years under the sponsorship of various federal agencies and industrial partners. A global picture will be revealed for future outlooks. This talk aims to provide useful design methodologies and tools in battery safety and inspire insightful discussions within the research community.

Biography
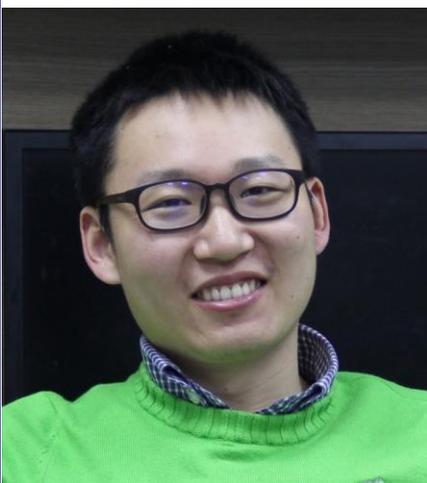
Dr. Jun Xu is an Assistant Professor in the Department of Mechanical Engineering & Engineering Science at the University of North Carolina at Charlotte. He is the director of Vehicle Energy & Safety Laboratory. Dr. Xu obtained his Ph.D. from Columbia University major in environmental engineering/engineering mechanics and returned to China in 2014. In 2018, Dr. Xu moved his research group to UNC Charlotte and established a new lab there. Dr. Xu's research area includes multiphysics modeling of lithium-ion battery safety issues and the design of advanced materials and structures under dynamic mechanical loadings. Dr. Jun Xu now serves as the Chair of Energy Conversion & Storage Committee and Chair of Multifunctional Materials Committee, ASME. He has so far published more than 110 peer-reviewed papers with more than 3000 citations and H-index=32.