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Electro-thermal modeling of lithium-ion battery packs from the safety perspective

Owing to high energy density ($\sim 400 \text{ Wh L}^{-1}$) and long working life, lithium-ion batteries (LIBs) are widely used as power sources for portable electronic devices. They are also being increasingly used for electric vehicles (EVs), hybrid electric vehicles and power plants. However, recurrent fire incidents involving mobile phones, laptops, EVs and airplanes have raised increasing concern regarding the safety of LIB during storage, transportation and applications. LIBs may rupture, ignite or even explode when it is subjected to high-rate charging, poor ventilation, overcharging, overheating, short circuit or compression. In the above aggravating and abuse conditions, the materials within the battery react with each other, generating heat accompanied by unmoral electrical behavior. This presentation will report on the ongoing collaboration between Warwick FIRE at University of Warwick in the United Kingdom and the State Key Laboratory for Fire Science (SKLFS) in the University of Science and Technology, China. The collaborative project aims to develop a predictive tool, which will be generic across all LIB types for lithium-ion battery (LIB) thermal management from the safety perspective. Such a tool can aid the development of safer LIB cells and the optimization of LIB packs balancing performance and safety requirement. The presentation will outline the ongoing development at Warwick FIRE. It will also present snapshots of previous experimental data from SKLFS which will be used to provide the heat release rate in the model as well as the new measurements dedicated to support the model development work at Warwick FIRE, which is being carried out in SKLFS.

Biography

Jennifer X Wen established and currently leads WARWICK FIRE, a multidisciplinary research laboratory for both fundamental and applied research related to fire and explosions as well as accidental releases of hazardous materials. As Principal Investigator, she holds over £2M live grants to support a wide range of research activities, which include hydrogen safety as well as the fire and explosion safety of lithium ion batteries. She has published more than 240 papers in reputed journals and conference proceedings. As Leading Guest Editor, she published three special issues on hydrogen safety for the *International Journal of Hydrogen Energy* between 2012 and 2014. She sits on the Science Board of the United Kingdom Hydrogen and Fuel Cells Research HUB and is also the Steering Committee Member of various professional bodies, organizing/scientific committee member, session chairs of numerous international conferences.

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