



Department of  
Mechanical Engineering  
The University of Hong Kong



## SEMINAR

### **Modelling and understanding of the cycling behaviors of silicon-based lithium-ion batteries**

**Date:** 17 August, 2023 (Thursday)  
**Time:** 4:30 p.m.  
**Venue:** Room 7-35, Haking Wong Building, HKU

**Speaker:** Dr. H.Z. Wang  
Senior Lecturer  
Department of Mechanical Engineering  
Imperial College London  
U.K.

#### **Abstract:**

Lithium-ion batteries (LIBs) are currently the dominant energy storage technology for consumer electronics, and they are expanding their applications to automobiles and stationary storage. The rapid expansion in LIB applications requires continuous improvements in energy density, power density, lifespan and safety, which has spurred research into novel LIB chemistries and even “beyond lithium” chemistries. One next-generation LIB solution that has been attracting considerable attention is to use silicon materials as the anode. In contrast to the intercalation carbonaceous materials, silicon is an alloying electrode material and thus can provide a theoretical capacity ten times higher than that of graphite. Silicon has unique electrochemical behaviors with a huge voltage hysteresis between the charge and discharge voltage curves. In this talk, I’ll first present a mechanistic study to reveal the origin of the path-dependent voltage hysteresis of silicon at different lithiation depth. I’ll next discuss the role of silicon in a silicon/graphite composite electrode using a multi-material electrochemical model. A dimensionless factor will be introduced to indicate the active regions of silicon and graphite materials and how it can be used to design cycling protocols for mitigating degradation of silicon/graphite electrodes will be demonstrated.

#### **Short Biography:**

Dr Huizhi Wang is a Senior Lecturer in the Department of Mechanical Engineering at Imperial College London, United Kingdom. She received her Ph.D. degree in Mechanical Engineering from the University of Hong Kong. Prior to joining Imperial College London, she was an Assistant Professor in the School of Engineering and Physical Sciences at Heriot-Watt University, Edinburgh. Her research center on electrochemical engineering with activities including design, manufacturing, characterization, and modeling of electrochemical energy devices such as fuel cells, batteries and electrolyzers. She has (co)authored over 100 articles in peer reviewed journals and several book chapters and patents.

**ALL INTERESTED ARE WELCOME**

For further information, please contact Prof. D.Y.C. Leung at 3917 7911.