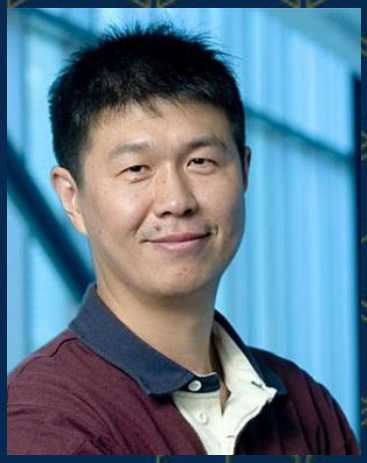
Materials Science and Engineering Department

Spring Seminar Series

Understand the Charge Transfer and Transport Process in Aqueous Zinc-Ion Batteries



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April 26, 2023
3-4PM | Hill Seminar Room (LeBow 240)

Metal-ion batteries have become a key technology for a wide range of applications, including portable electronics and electric vehicles. Although lithium-ion batteries (LIBs) based on an intercalation charge storage mechanism are the dominant battery technology, their safety (e.g., toxic and flammable electrolytes), material and manufacturing costs associated with supply chain crunch (e.g., lithium, cobalt, and nickel raw materials) have been lingering concerns. Aqueous rechargeable zinc ion battery (ARZIBs) utilizing Zn metal anode has attracted increasing attention. However, Zn-ion storage, especially in cathode materials, is plagued by strong electrostatic interaction between Zn^{2+} and electrode, imposing a substantial hurdle in achieving adequate storage capacity, transport kinetics, and cycle life. This presentation provides recent efforts from our research group on developing advanced vanadium-based cathode materials to facilitate Zn-ion transport. Using a combination of *in operando* synchrotron X-ray diffraction, X-ray pair distribution function analysis, and absorption spectroscopy, our work has emphasized understanding several key factors affecting the charge transport and transport processes in Zn-ion batteries, including charge carrier, V-O polyhedra, and local structure details.

Xiaowei Teng is James H Manning Professor in the Department of Chemical Engineering at Worcester Polytechnic Institute. Teng received his B.S. and MS from East China University of Science and Technology in 2001 and his Ph.D from University of Rochester in 2006. Prof. Teng was a postdoctoral researcher in Center for Functional Nanomaterials at Brookhaven National Laboratory deom 2006-2008. His research focuses on electrochemical engineering, particularly aqueous batteries and the conversion of small organic molecules for electricity. He loves to work with people to transform innovative and collaborative energy research through knowledge and scientific discoveries. Prof. Teng is committed to connecting industries, national laboratories, and public agencies, working toward renewable energy solutions and technologies, and training and educating the next generation of energy researchers and the workforce.

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