Introduction to Battery Materials and Battery Chemistry

MSE599 (graduates)/MSE498 (undergraduates)

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Instructor: Jun Liu; Co-instructor: Jihui Yang

Energy storage materials and technologies have a transformational impact on modern society. The purpose of this class is to provide a solid foundation of battery materials and chemistries, as well as a broad perspective of how knowledges from energy research are creating new technologies and new lifestyles. The topics will cover the history of battery development, latest advances in battery materials and battery chemistry, as well as specific requirements for modern applications. Each topic will be taught by a leading expert in the field, including Professor M. Stanley Whittingham, the 2019 Nobel Laurate in chemistry. This class will create a unique opportunity for students to interact with and learn from top scientists in the world.

Preliminary list of lectures:

Jun Liu, Washington Foundation Innovation and Campbell Chair Professor, University of Washington, Battelle Fellow Pacific Northwest National Laboratory, Director, Battery500 Consortium, from battery materials to energy systems.
M. Stanley Whittingham, Distinguished Professor, U Binghamton, 2019 Nobel Prize Laurate in Chemistry for the invention of Li-ion batteries: development of Li-ion batteries and next generation energy storage technologies.
Jihui Yang, Kyocera Chair Professor and Vice Dean of College of Engineering: engineering challenges for energy.
Kang Xu, Fellow, Army Research Laboratories: Li-ion battery histories and electrolytes.
Vince Sprenkle, Strategic Advisor for Energy Storage, Pacific Northwest National Laboratory: Department of Energy Energy Storage Grand Challenge.
Tien Duong, Program Manager, DOE Vehicle Technology Office, batteries for electric vehicles and electric drive trains.
Zhonglin Wang, George Tech Institute, Professor, nanoenergy generation.
Arumugam Manthiram, Cockrell Family Regents Chair Engineering, UT Austin: advanced cathode materials.
Yi Cui, Professor and Director of Precourt Energy Institute, Stanford University, nanostructured electrode materials.
Nick Wu, Professor, University of Massachusetts Amherst: Batteries for biosensing and detection.
Wei Wang, Chief Scientists, Pacific Northwest National Laboratory: redox flow batteries for energy storage.
Esther Takeuchi, Distinguished Professor, Stony Brook University and National Academy Engineering Member, batteries for biomedicine.
Khalil Amine, Distinguished Fellow, Argonne National Laboratory: Li-S and Li-air batteries.
Donghai Wang, Professor, Penn State University, Li metal protections for high energy batteries.
Dongping Lu, Senior Scientist, PNNL: solid electrolytes and solid batteries.
Juergen Garche, Professor, FCBA Institut Technologique Germany: systematic approach to battery safety.

Chungshen Wang, Professor, Director of Center for Research in Extreme Batteries (CREB), University of Maryland: emerging battery chemistries and battery technologies.
Mei Cai, Technical Fellow and Manager of Battery Research, GM: electric vehicles.
Jie Xiao, Laboratory Fellow and Technical Manager, Pacific Northwest National Laboratory: demonstration of battery and cell design principles.