Winter 2024 Joint Colloquium
Materials Department & Materials Research Laboratory

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Next Generation Additive Manufacturing for Structured Electrode Lithium-ion Batteries

Achieving high-energy and high-power density Lithium-ion batteries (LIBs) with fast charging capabilities is critical to advancing electric vehicle (EV) and portable electronic technologies. Long-range, fast charge EVs and compact portable electronics require significant advances in battery performance, lifetime, and cost. Commercialized LIBs are composed of flat anode and cathode electrode stacks which are optimized for either energy or power but not both at the same time. This is due to fundamental ion transport limitations that occur with increases in electrode thickness. Researchers are exploring improving LIB performance through material innovations with lithium metal or silicon anodes and high-voltage cathode and electrolyte materials, to name a few. Structured Electrode (SE) and three-dimensional (3D) battery designs have been investigated as an alternate solution to address these challenges. SEs engineer electrode materials into different 3D architectures on a scale ranging from tens to hundreds of microns to facilitate rapid ion-transport in thicker electrodes. While a promising concept, reliable and scalable manufacturing methods for fabricating SEs over the complex areas needed for EV and portable electronic applications remains limited.

This talk covers manufacturing and material approaches investigated by my research group to fabricate SEs rapidly and efficiently over large, complex areas. Both computational and experimental methods are employed to facilitate the development of new hardware, software, material formulations, and processing techniques for SEs, with a focus on new additive manufacturing approaches and their impact on the rate capability and charge/discharge capacity of LIBs.

Bio

Dr. Corie L. Cobb is the Washington Research Foundation Professor in Clean Energy and is a Professor of Mechanical Engineering and an Adjunct Professor of Human Centered Design & Engineering at the University of Washington (UW). At the UW, Dr. Cobb is also a faculty member of the Clean Energy Institute and the Molecular Engineering and Sciences Institute. She came to the UW from Palo Alto

Research Center, Inc. (formerly known as Xerox PARC) where she was a Senior Member of Research Staff leading research projects on advanced manufacturing technologies for solar cells and batteries. Dr. Cobb's research lies at the intersection of manufacturing, engineered materials, and computational design for printing and patterning of functional materials for clean energy applications. Her research has been funded by DOE, ARPA-E, DARPA and industrial partners. Prior to PARC, Dr. Cobb worked at Applied Materials and held internship positions at Hewlett-Packard, Bell Labs, Google and Toshiba.

Dr. Cobb is a recipient of the DARPA Young Faculty Award, DARPA Director's Fellowship, 3M Non-Tenured Faculty Award and was recently elected to the Washington State Academy of Sciences. Dr. Cobb received her Ph.D. in Mechanical Engineering from the University of California at Berkeley. She holds a master's degree in Mechanical Engineering and a bachelor's degree in Product Design from Stanford University.

https://www.me.washington.edu/people/faculty/corie_cobb

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Hosted by Chris Bates