

SUSAN ODOM: A LASTING LEGACY FOR WOMEN IN STEM

Dr. Odom established a robust and well-funded research program, serving as the principal investigator or co-investigator on numerous research grants, and served key positions in several large-scale collaborative research efforts. Her main research focus was in the area of power storage; when the often-quoted rail against renewable energy was uttered - 'what happens when the sun doesn't shine or the wind doesn't blow?' - her vocal response was always 'batteries!'. Dr. Odom's research efforts were lauded by the scientific community; from 2017 - 2019, she was a Research Corporation for Scientific Advancement Scialog Fellow for Advanced Energy Storage, and in 2020 she was awarded the American Chemical Society's 'Rising Star Award' from the Women Chemists Committee.

Dr. Odom was a co-organizer of the Expanding Your Horizons program, a STEM conference for middle school girls and their parents, to encourage young women to pursue careers in science and engineering. She also was active in the Kentucky American Council of Education Women's Network, which supports the advancement of women in higher education.

The Susan A. Odom Endowment continues Professor Odom's vision of excellence and diversity in materials research.

Professor Susan Odom was an energetic, productive, and driven faculty member in the Department of Chemistry from 2011 to 2021.

Questions about this year's lecture can be directed to chemistry@uky.edu

chem.as.uky.edu



SUSAN A. ODOM LECTURE

“Chemo-mechanics in all solid state batteries”

Friday, November 1, 2024

4:15 PM

Jacobs Science Building, 121

Dr. Kelsey Hatzell

Associate Professor, Princeton University
Andlinger Center for Energy and Environment and
Department of Mechanical and Aerospace Engineering

**Established in memory of Professor Susan A. Odom '03
(1980 - 2021)**

UK Chemistry faculty, 2011 - 2021



LECTURE ABSTRACT

Li-free solid-state batteries, which contain no excess Li metal initially, are considered promising next-generation energy storage systems due to their high energy density and enhanced safety. However, heterogeneous Li plating onto the current collector leads to early failure and low energy efficiency. Porous interlayers positioned between the current collector and solid electrolyte have the potential to guide uniform Li plating and improve electrochemical performance. In this configuration, both the electrochemical reduction of Li ions and mechanical deformation, which allow Li metal to flow into the porous interlayer, occur simultaneously. These complexities make understanding Li plating kinetics challenging. Factors such as stack pressure, interlayer composition, current density, and the mechanical response of the interlayer can influence Li deposition kinetics. In this talk we discuss how heterogeneous plating can cause fracture in the cathode and impacts the reversible operation of li-free solid state batteries. We examine a model porous Ag-C interlayer with two different Ag particle sizes and observed Li plating behavior under various stack pressures and current densities. While Ag nanoparticles in the interlayer can facilitate Li movement, they can also induce internal stress, leading to void formation that impedes Li flow. Nanostructure analysis using cryo-FIB are combined with chemomechanical modeling to uncover the mechanical interaction of interlayer during the alloying reaction between Ag and Li. When comparing the morphology of Li electrodeposits at different conditions, morphological changes correlate with the creep strain rate over Li ion flux. The electrochemical performance is determined by the morphology of Li electrodeposits rather than the Li plating current density.



DR. KELSEY HATZELL

Dr. Hatzell is an Associate Professor at Princeton University in the Andlinger Center for Energy and Environment and department of Mechanical and Aerospace Engineering. Dr. Hatzell earned her Ph.D. in Material Science and Engineering at Drexel University, her M.S. in Mechanical Engineering from Pennsylvania State University, and her B.S./B.A. in Engineering/Economics from Swarthmore College.

Hatzell is the recipient of several awards including the ORAU Powe Junior Faculty Award (2017), NSF CAREER Award (2019), ECS Toyota Young Investigator Award (2019), finalist for the BASF/Volkswagen Science in Electrochemistry Award (2019), the Nelson "Buck" Robinson award from MRS (2019), Sloan Fellowship in Chemistry (2020), and POLiS Award of Excellence for Female Researchers (2021),

NASA Early Career Award (2022), ONR Young investigator award (2023) and Camille-Dreyfus Teacher-Scholar Award (2024).

The Hatzell Research Group works on understanding phenomena at solid | liquid, solid | gas, and solid | solid interfaces through non-equilibrium x-ray techniques, with particular interest in materials for energy conversion and storage and separations applications.

DR. SUSAN A. ODOM



Dr. Odom pushed for excellence in every task that she undertook, and this lecture series was established to celebrate her spirit and commitment to excellence in materials chemistry.

Susan Odom, a native of Paducah, Kentucky, always had an intense sense of curiosity and a passion for science. She attended the University of Kentucky for her undergraduate studies, specializing in organic chemistry and performing research in the development of new materials for organic light-emitting diodes. A highly productive researcher from the start, she was listed as a co-author on four peer-reviewed publications, the lead author on one publication, and was a co-inventor on a royalty-generating patent before completing her undergraduate work. She earned her Ph.D. from the Georgia Institute of Technology, supported by a National Science Foundation (NSF) Doctoral Fellowship to work with Professor Seth Marder, in the development of new charge-transporting materials for flexible electronics.

She followed her funding success to earn a Post-Doctoral Fellowship from the NSF to work with Professor Jeffrey Moore at University of Illinois Urbana Champagne in the area of self-healing polymers. Dr. Odom returned to the University of Kentucky as an Assistant Professor in the Department of Chemistry in 2011, and was tenured and promoted to Associate Professor in 2017. Dr. Odom established herself as an unfaltering proponent of undergraduate and high-school research, hosting numerous students in her laboratory and producing peer reviewed publications from their research efforts. She focused on outreach to younger students and the public, showing for example the strong relationships between science and art.