# Abstract

Organic semiconducting polymers present a versatile platform for energy conversion and storage and sensing devices due to tunable optical and transport gaps, compatibility with electrolytes, and scalability via solution processing. The Center for Soft Photoelectrochemical Systems (SPECS) is an Energy Frontier Research Center that focuses on understanding the fundamental factors that control charge and matter transport processes that underpin energy conversion and storage technologies across spatiotemporal scales in scalable, durable, π-conjugated polymer materials. Within SPECS, we aim to establish design rules for robust photocathode systems that elucidate key structure–property relationships related to charge transport, charge transfer, and operational durability.

Our initial device employs a bulk heterojunction (BHJ) strategy, combining PTB7-Th (hole transport) and N2200 (electron transport) polymers, deposited on passivated ITO and capped with a hydrogen evolution reaction (HER) catalyst (e.g., Pt or $RuO_2$), all immersed in an acidic electrolyte. Insights from optoelectronic analogs guide our focus toward enhancing chemical and mechanical interfacial stability and enabling selective charge extraction.

Efforts that will be described in this talk include multiple spectroelectrochemical methods and theoretical efforts to reveal the impact of electrochemical doping and ultimately serve as signatures to drive charge transfer reactions such as solar fuel production. Other highlights will include opportunities to functionalize various interfaces to increase rates of hydrogen evolution.

*This lecture series commemorates the life and legacy of Professor Susan A. Odom, an energetic and driven faculty member, pioneer in renewable energy storage, and champion of undergraduate research*

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

# Susan A. Odom Lecture

"Soft Photoelectrochemical Systems for Energy Conversion and Storage"

**Dr. Erin Ratcliff**

Georgia Institute of Technology

**Friday, February 6**

**4:00pm**

**321 Jacobs Science Building**

Established in memory of
Professor Susan A. Odom '03 (1980-2021)
UK Chemistry faculty 2011-2021

College of Arts and Sciences
Department of Chemistry

# Erin Ratcliff

Dr. Erin Ratcliff is a Professor of Materials Science and Engineering and Chemistry and Biochemistry at the Georgia Institute of Technology and holds a joint appointment at the National Renewable Energy Laboratory. She was the Director of the Department of Energy-funded Energy Frontier Research Center (EFRC) entitled “Center for Soft PhotoElectroChemical Systems (SPECS)” prior to moving to Georgia Tech in August 2024, where she is now Associate Director of SPECS. Her group, the “Laboratory for Interface Science of Printable Electronic Materials (LISPEM)” focuses on multi-length scale investigations of printable electronic materials for energy conversion and storage applications and chemical sensing. Students in her group work on highly multidisciplinary projects at the intersection of physics, engineering, and chemistry, connecting device performance with fundamental understanding of semiconductors, electrochemical phenomena, interfaces, and durability of printable materials.

College of Arts and Sciences
*Department of Chemistry*

# Susan A. Odom

*Dr. Odom pushed for excellence in every task that she undertook*

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 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. 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.

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.