

# Interactions between Temperature and Battery Performance and Enabling Sodium Sulfur Batteries

**Dr. Rachel Carter**

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**February 7th, 2023, 11:00 am to 11:45am, Black 2004**

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## **Abstract:**

Part I -We have identified electrochemo-mechanical interactions, which dictate battery safety and performance. These interactions have been probed in state-of-the-art Li-ion batteries and emerging Li-ion battery technologies. Micro-CT analysis corroborates electrochemical observations and accelerating rate calorimetry assesses safety implications.

Part II -Ambient sodium-sulfur batteries are not realized due to their complex conversion reaction. We utilize unique in-situ spectroscopy and optical microscopy to better understand the fundamentals of the reaction. We identify more effective electrolyte environments and demonstrate new techniques to facilitate cycling.

## **Biography:**

Dr. Rachel Carter is a Research Mechanical Engineer at the U.S. Naval Research Laboratory (NRL) in Washington, D.C. Prior to this role, she held the positions of Karles Distinguished Scholar Fellow and National Research Council postdoctoral fellow at NRL. In 2019, she was awarded the MRS Postdoctoral Award. Dr. Carter received her Ph.D. in mechanical engineering from Vanderbilt University in 2017. Her dissertation research focused on material and processing challenges for alkali-sulfur batteries, which boast 6× the energy of Li-ion with lower cost and more environmentally friendly materials. At NRL, Dr. Carter continues to work on sulfur chemistries while also focusing on safer and more effective uses of conventional Li-ion batteries. In her nine years as an energy storage researcher, she has published 57 peer-reviewed articles (h-index 31, i10-index 49) and obtained three patents. In 2019, Dr. Carter was recognized by Nature as a top 5 emerging material scientist. In efforts to support women in STEM, Dr. Carter was a co-founder of the Partnership of Women across the Naval Research Enterprise and has had the opportunity to mentor many young female researchers from the high school to graduate level.

**\*This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.**

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