

MATERIALS SCIENCE and ENGINEERING SEMINAR



Dr. Steven R. Spurgeon

National Renewable Energy Laboratory

**From Chaos to Clarity: Autonomous Materials Discovery for
Extreme Environments**

The pursuit of advanced functional materials for energy applications demands an understanding of their behavior under the most challenging conditions. Extreme environments, characterized by intense radiation, high temperatures, and corrosive chemistries, push materials to their limits, often revealing unexpected behaviors and degradation pathways. Traditional materials research approaches, relying on trial-and-error experimentation, are often slow and resource-intensive, ill-suited to the complexities of extreme environments. This talk will explore the transformative potential of autonomous materials science in revolutionizing our understanding of materials synthesis and degradation in extreme environments. By integrating advanced microscopy techniques, artificial intelligence, and robotic experimentation, we can accelerate the discovery and design of resilient materials for a sustainable future. The presentation will highlight recent breakthroughs in autonomous microscopy, computer vision, and machine learning, showcasing their ability to unravel complex material transformations at the atomic scale. The talk will also delve into the challenges and opportunities associated with deploying autonomous systems to probe extreme environments, emphasizing the importance of robust algorithms, real-time data analysis, and adaptive experimentation. The ultimate goal is to empower scientists with unprecedented capabilities to explore, understand, and engineer materials that can withstand the harshest conditions, paving the way for innovations in energy, aerospace, and beyond.

BIOGRAPHY

Dr. Steven R. Spurgeon is a leading figure in materials data science, currently spearheading research at the National Renewable Energy Laboratory and the University of Colorado-Boulder. His work focuses on the development and application of AI-driven techniques to understand the synthesis and degradation of functional materials in extreme environments, crucial for advancements in electronics, sensing, and computing. Dr. Spurgeon's innovative research has been widely recognized, earning him prestigious awards, such as the R&D 100 and early career prizes / fellowships from the Department of Energy, the National Science Foundation, the Department of Defense, and the Microscopy Society of America. His contributions extend beyond research, as he actively mentors students, fosters commercial partnerships, and shapes the future of materials science through leadership roles in professional societies.

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