Nuclear Engineering Seminar

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Atomistic modeling to accelerate the development of advanced nuclear fuels

Abstract

Advanced reactors are driving the frontiers of research and development in the energy sector. While pushing for accelerated development timelines, a thorough understanding of these systems and their constituent materials is required for licensing and deployment. Mechanistically informed fuel performance modeling is a tool for accelerated qualification, but also requires lower-length scale modeling and experiments for proper description. Specifically, atomistically-informed properties, behaviors, and phenomena can reduce uncertainty and directly inform engineering scale models, while also informing experimental efforts and interpretation. In this talk, I will show some examples of atomistic scale simulations which are informing engineering scale fuel performance simulations, identifying the core multiscale modeling framework behind mechanistic fuel performance modeling.

Dr. Benjamin Beeler is an Associate Professor in the Nuclear Engineering Department at NCSU. He received his B.S., M.S., and Ph.D. degrees in Nuclear and Radiological Engineering from the Georgia Institute of Technology. He was a postdoctoral researcher jointly at the University of California, Davis and the University of California, Berkeley. Before joining the NC State faculty, he was a computational scientist in the Computational Microstructure Science group in the Fuels Modeling and Simulation Department at Idaho National Laboratory. He is an expert in density functional theory and molecular dynamics, and currently maintains a group of 10+ graduate and undergraduate students pursuing research on advanced nuclear materials and related systems.