CHEMICAL & BIOMEDICAL ENGINEERING GRADUATE SEMINAR ANNOUNCEMENT

Dynamics, Glass Formation, and Relaxation of Polymers in Interfacially Rich Nanomaterials

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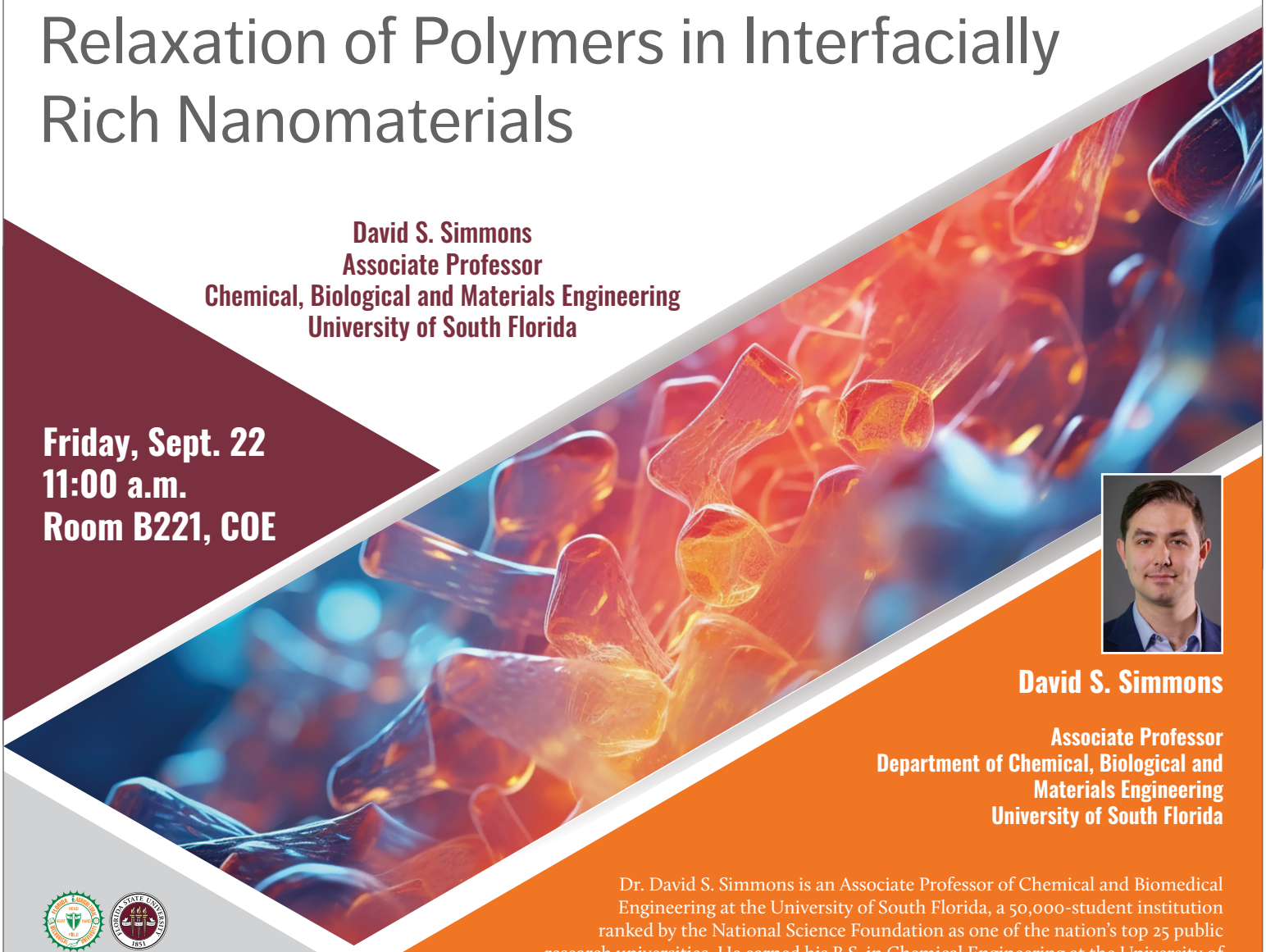
Friday, Sept. 22
11:00 a.m.
Room B221, COE



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Dr. David S. Simmons is an Associate Professor of Chemical and Biomedical Engineering at the University of South Florida, a 50,000-student institution ranked by the National Science Foundation as one of the nation's top 25 public research universities. He earned his B.S. in Chemical Engineering at the University of Florida before completing his Ph.D. in Chemical Engineering from the University of Texas at Austin, followed by a National Research Council postdoctoral fellowship at the National Institute of Standards and Technology. Dr. Simmons then spent six years on the faculty of the Department of Polymer Engineering at the University of Akron, before joining the University of South Florida family in 2018. His research group combines computer simulations, machine learning, theory, evolutionary algorithms, and laboratory experiments to design and understand polymers and other next-generation advanced materials. Major research areas in the Simmons group include physics and design of glass-forming materials, dynamics and mechanics in nanostructured materials, mechanical properties of nano-filled elastomers, and rational design of sequence-specific polymers.

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Diverse polymers, small-molecule liquids, and colloids exhibit large alterations in relaxation dynamics, glass transition temperature, and transport properties under nanoscale confinement and in the nanoscale vicinity of interfaces. These alterations have major technological implications, ranging from the stability of polymeric nanostructures to mechanical reinforcement in polymeric nanocomposites to the formation of ultrastable glasses. Moreover, they are implicated in the underlying nature of the glass transition, a long-standing grand challenge of materials science. For this reason, dynamics under nanoconfinement have been the subject of over 30 years of intense study. However, their underlying mechanistic origin and even their overall phenomenology has remained unresolved. Here, I describe progress by our group, along with several collaborators, in establishing a cohesive understanding of the phenomenology of the effects, arriving at a mechanistic picture of their origins, and sorting out their ultimate impact on polymer relaxation behavior near interfaces and under nanoconfinement.