CHEMICAL & BIOMEDICAL ENGINEERING SEMINAR ANNOUNCEMENT

Multicomponent Composite and Foam Property Tailoring via Micro-structuring

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Associate Professor
Mechanical & Industrial Engineering
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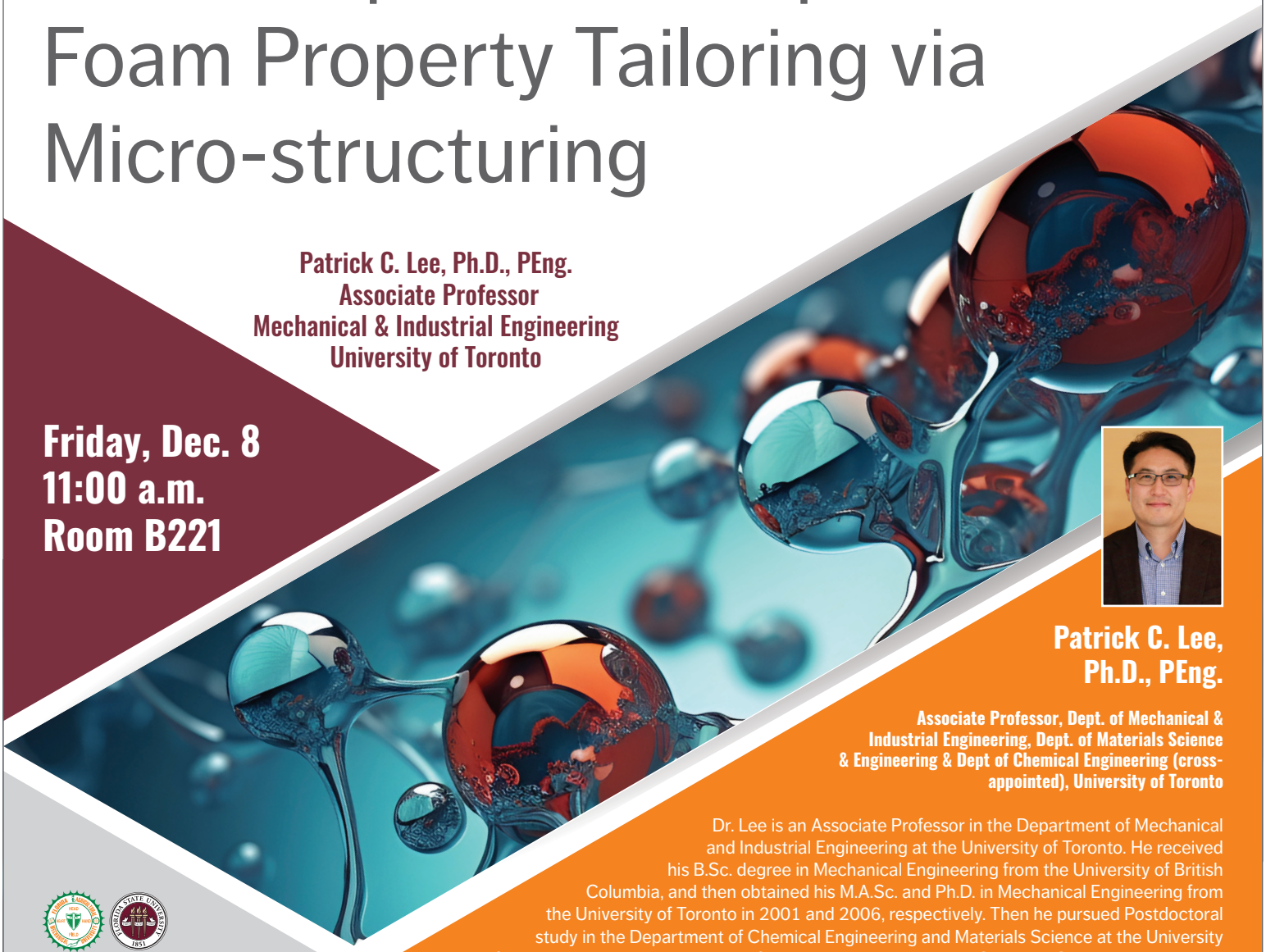
Friday, Dec. 8
11:00 a.m.
Room B221



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Associate Professor, Dept. of Mechanical & Industrial Engineering, Dept. of Materials Science & Engineering & Dept of Chemical Engineering (cross-appointed), University of Toronto

Dr. Lee is an Associate Professor in the Department of Mechanical and Industrial Engineering at the University of Toronto. He received his B.Sc. degree in Mechanical Engineering from the University of British Columbia, and then obtained his M.A.Sc. and Ph.D. in Mechanical Engineering from the University of Toronto in 2001 and 2006, respectively. Then he pursued Postdoctoral study in the Department of Chemical Engineering and Materials Science at the University of Minnesota. Dr. Lee began his professional career at The Dow Chemical Company in 2008. He was a Research Scientist and Project Leader in Dow's Research and Development organization. Dr. Lee joined the Department of Mechanical Engineering at The University of Vermont as an assistant professor in 2014. Since joining UVM, he created his own research platform on the lightweight and smart composite structures. He joined the Department of Mechanical and Industrial Engineering at The University of Toronto starting July 1st, 2018. Dr. Lee received the G.H. Duggan Medal from Canadian Society for Mechanical Engineering (CSME) in 2020, the AKCSE Early Achievement Award in 2019, the US National Science Foundation Early Faculty Career Development Award (NSF CAREER) in 2018, the Polymer Processing Society (PPS) Morand Lambla award in 2018, the Hanwha Advanced Materials Non-Tenured Faculty Award in 2017, and 3 best paper awards from the Society of Plastics Engineer (2005, 2 in 2011).

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Most new polymeric products contain two or more polymers and/or functional additives resulting in desired properties contributed from each component. Recently, our group is focusing on creating hierarchically structured hybrid composites and coextruded micro-/nano-layered structures to tune the material properties. In this presentation, an approach will be presented to develop synergy-induced hierarchically structured Polypropylene (PP)-based hybrid composites, reinforced with Graphene Nanoplatelets (GnP) and Glass Fibers (GF), capable of achieving advanced properties and functionalities. These advanced multifunctional hybrid composites can be tailored for a variety of high-performance applications by exploiting the mechanisms governing the synergistic effect. In this hierarchical system, the GnPs (i.e., nano-sized filler) are chemically and electrostatically attached to the GFs (i.e., micro-sized filler), favoring load transfer at the interface, while simultaneously enhancing the crystalline microstructure of the PP matrix. Furthermore, the volume exclusion effect induced by the GFs, promotes the formation of GnP-based conductive networks. Strategically controlling the reinforcement concentrations has been proven to directly influence the magnitude of these mechanisms, effectively enhancing the synergistic effect, thereby allowing the mechanical, electrical, and thermal conductive properties of these advanced hybrid composites to be tailored based on their application.