



Tequila Harris

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“Scaled Coating of Polymer Thin Films onto Permeable and Impermeable Substrates”

Friday, October 10
108 Snell Engineering
11:45 a.m. – 1:00 p.m.

*Refreshments will be
served*

ABSTRACT Technologies for the energy, electronics, and environmental sectors require the ability to efficiently mass-produce high quality thin films at high rates and low cost. To this end, we conduct fundamental research to understand mechanisms that impact the scaling of thin films from laboratory to commercial production rates, as they are coated onto permeable and impermeable surfaces. In this talk, the feasibility of employing scalable roll-to-roll processes to coat fluids, such as membrane solutions, onto permeable and impermeable substrates with minimal waste, optimal coating uniformity and high quality will be discussed. Specifically, experimental, numerical, and analytical approaches have been utilized to study the wetting behavior and transport phenomena of relatively high viscosity (10^2 Pa s) non-Newtonian fluids in relation to the slot die extrusion process and various substrates. Mechanisms that lead to defect generation (pinholes and air entrainment) in this class of fluids have been elucidated. It has been found that two distinct mechanisms exist, where one is directly related to the pre-metering of fluid while slot coating. New empirical models have been developed to predict the onset of such defects during the coating process with 10% accuracy. In addition, fluid penetration into permeable media during the coating process and the ability to control the penetration depth in

order to directly coat membranes onto permeable substrates has been studied. To this end, analytical models have been developed to accurately predict the fluid penetration depth.

BIOGRAPHY Dr. Tequila Harris is currently an Associate Professor at Georgia Institute of Technology (Georgia Tech), in the George W. Woodruff School of Mechanical Engineering. Prior to joining Georgia Tech, she earned her Masters and Doctorate degrees from Rensselaer Polytechnic Institute and a Bachelors in Physics from Lane College. Dr. Harris’ research is focused on exploring the connectivity between the quality of thin films based on their manufacture as it relates to their functionality, durability and performance. Her aim is to elucidate mechanisms that cause system failure that are instituted at the manufacturing stage of the lifecycle. With the use of simulations and experimentation, she has introduced unique models and approaches to predict and control the quality of thin films, processed on permeable and impermeable substrates. By addressing the associated complex fundamental problems, she aims to impact a plethora of industries, although applications of direct interest include energy (e.g., polymer electrolyte membrane fuel cells), electronics (e.g., organic electronics), and environmental (e.g., water). Dr. Harris has received several awards and honors, of note, the National Science Foundation CAREER Award and the Lockheed Martin Inspirational Young Faculty Award.