



## Department of Chemical Engineering presents

Professor G. Kane Jennings



Department of Chemical & Biomolecular Engineering  
Vanderbilt University  
December 12, 2018

Goergen Hall 101 @ 3:25pm

### “Polymer Thin Films by Surface Initiation: From Bioreplica Superhydrophobicity to Metal Chelation and pH-Responsiveness”

The ability to control the composition, thickness, and topography of polymer thin films can impact a broad array of applications. In this seminar, I will discuss our use of surface-initiated ring opening metathesis polymerization (SiROMP) to produce versatile polymer films in which the composition of the side chains governs the film properties and applications. Nature provides limitless inspiration for the design of new materials. In the first part of the seminar, I will introduce a process termed micromolding surface-initiated polymerization in which we are able to replicate the microscale surface topography of superhydrophobic plant leaves to achieve polymer coatings with matching superhydrophobicities. In this case, the side chain composition is an oleophobic and hydrophobic perfluoroalkyl chain that dominates the surface to yield critical surface tensions well below that of Teflon. In the second part of the seminar, I will review our new approach to grow thin films that have pendant acyl chlorides that can be converted to nearly limitless side chain compositions. As one example of these versatile thin film platforms, we simply expose the polymer film to a mixture of water and ethanol to achieve a random copolymer that contains both ester and carboxylate functionality. By controlling the solution ratio of ethanol to water, we can control the film hydrophobicity and thus, the critical pH in which the film swells with water to allow facile electrolyte transfer. With proper compositional design, these films exhibit a remarkable 10,000x change in their resistance to ion transfer over a single pH unit. As another example of these same thin film platforms, we modify the pendant acyl chlorides to hydroxamic acids for the effective chelation of divalent metal ions to detect the chemical onset of corrosion in metal piping. These chelated metal ions cross-link the polymer film and greatly enhance its thermal stability and shear storage modulus.