ChBE Faculty Candidate Research Seminar
10AM, Tuesday, January 17
Barnard Hall 323

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Production of Renewable Fuels and Chemicals from Lignocellulose: Relating Plant to Cell Wall Properties to Processing Outcomes

Abstract:
As the global demand for energy grows, the need for sustainable sources of energy and carbon as a supplement or replacement for fossil fuels is becoming imperative. Among possible technology options, the chemical, catalytic, or biochemical conversion of the structural polymers contained within plant cell walls (*i.e.* lignocellulosic biomass) to biofuels, biochemicals, and biomaterials has the potential to displace a substantial fraction of current petroleum consumption. A key obstacle in the utilization of lignocellulosic biomass as a feedstock fuels and chemicals lies in the recalcitrance of plant cell walls derived from cell wall biopolymer composition, organization, and higher order structure. Utilizing properties of plant cell walls or plant cell wall biopolymers to predict their response to a conversion process can be challenging due to the complexity of the cell wall across length scales spanning several orders of magnitude. This challenge to characterization will be the subject of this talk and the application of select characterization approaches to predict plant cell wall responses to a conversion process will be highlighted with illustrative examples. These examples will include: **(1)** identifying relationships between plant cell wall properties in diverse plants and plant tissues to the cell wall's response to deconstruction to sugars, **(2)** utilizing cell wall water sorption and water association with plant cell walls to characterize the accessibility to hydrolytic enzymes in pretreated corn stover and switchgrass as well as transgenic *Arabidopsis* as utilizing water retention value, cryoporosimetry, and NMR relaxometry, **(3)** application of NMR to characterize lignin properties that can be correlated to both phase partitioning behavior of these lignins in a novel fractionation process and the potential yield of aromatic monomers generated using three lignin depolymerization approaches.

Biography of David Hodge:
Dr. David Hodge is an Associate Professor at Michigan State University in the Department of Chemical Engineering and Materials Science with a joint appointment in Biosystems & Agricultural Engineering. The research performed by Dr. Hodge's group at Michigan State University addresses the challenges associated with the conversion and fractionation of plant cell wall biopolymers as well as food crops to renewable energy and fuels. This research has been funded by the Department of Energy, the Northeast Sun Grant, and the National Science Foundation. He obtained his undergraduate degree in Chemical Engineering from Auburn University with a specialization in pulp and paper engineering and obtained MS and PhD degrees in Chemical Engineering from Colorado State University. This was followed by work at the U.S. Department of Energy's National Renewable Energy Laboratory as post-doctoral researcher and a subsequent research faculty position at Luleå University of Technology.