# CHEMICAL ENGINEERING

SEMINAR SERIES

## MARCUS FOSTON

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# Reductive Conversion of Lignin with Copper–doped Catalysts

**ABSTRACT:** The lignin component of biomass has potential as a renewable source for industrially useful aromatic chemicals. While technologies for the selective conversion of the carbohydrate components have been successful, lignin is generally treated as waste and burned for low grade heat. We have developed a catalytic system, based on a copper-doped porous oxide, which can reductively disassemble lignin in supercritical methanol with little to no char formation. While the copper-doped porous oxide catalyzes C-O hydrogenolysis of aryl-ether bonds linking lignin monomers, it also catalyzed ring methylation and hydrogenation, leading to lignin disassembly product proliferation. We have found that adding dimethyl carbonate can significantly suppress the hydrogenation of the phenolic intermediates responsible for much of the undesirable product diversity by methylation of phenolic hydroxyl groups to form a more stable aryl ether species. Using the methanol and dimethyl carbonate solvent system with the copper-doped porous oxide catalyst, O-methylation of phenolic hydroxyl groups was effective at increasing aromatic yields from a number of lignin model polymer systems and poplar organosolv lignin. These results demonstrate the promise of our copper-doped porous oxide catalyst when used in the presence of methanol and dimethyl carbonate to facilitate aromatic compound production from lignin.

**RECEPTION 3:30 • LECTURE 4:00 – 5:00**
**PHYSICS ASTRONOMY BLDG. PAA A110**

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**BIOGRAPHY:** Marcus Foston is an assistant professor in the Energy, Environmental, and Chemical Engineering Department at Washington University in St Louis. He received his PhD in polymer chemistry in the Material Science and Engineering Department at the Georgia Institute of Technology and soon after completed a postdoctoral fellowship in the School of Chemistry and Biochemistry at the Georgia Institute of Technology. His current research program is directed at the development of innovative and novel routes to exploit and utilize biomass resources. Dr. Marcus Foston primary research themes are: (1) the characterization of biomass in an effort to understand, design, and optimize its downstream conversion, (2) the development of processes that are designed to convert lignin into value-added chemicals and materials, and (3) the synthesis novel biomassderived synthetic polymers for specific applications.