Multi-scale Simulation and Experimental Study of Bio-oil Upgrading Technologies

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2004 Black

Abstract:
Our energy industry is facing multiple challenges as we begin the 21st century: rising fuel costs, explosive energy demand, and environmental concerns to name a few. Understanding and developing technologies that allow bioproducts to leverage the existing infrastructure is one pathway to accelerating the adoption of biofuels. Our research employs a multi-scale simulation and experimental approach to the study of biofuels and bioproducts.

Previous work investigated the economic and environmental performance of biofuel technologies using various simulation tools: process simulation and economic modeling to estimate the potential for gasoline and diesel biofuels via biomass fast pyrolysis and bio-oil refining; and optimization models of the biomass supply chain to study the large-scale implications of biomass thermochemical conversion technologies. Recently, our group described the economic trade-offs of hydrogen source in the bio-oil upgrading process and developed a response surface fit of this process. This response surface provides a reduced order model (ROM) for rapid analysis. Our simulation work complements the development of a catalytic approach to improving the chemical properties of bio-oil by investigating the large-scale implications of technological breakthroughs.

This presentation will describe the motivations, pathways, and challenges of the modern biofuel industry. We will discuss aspects of biofuel research, which seek to develop technologies and scenarios that make bioproducts suitable for existing infrastructure using a multi-scale simulation and experimental approach.

Biography:
Dr. Mark Wright is currently a Chemical Engineering Post-Doctoral Research Associate in the Román Group at the Massachusetts Institute of Technology investigating biomass conversion. His research focuses on bio-oil upgrading technologies, and in particular techno-economic modeling, analysis, and optimization. Mark received his Ph.D. from Iowa State University in 2010, where he received the George Washington Carver award for his advancements in the area of biorenewable technologies. As a graduate student he also won the Graduate Research Award and worked as a guest researcher at the National Renewable Energy Laboratory in 2008. Mark has presented several invited talks and co-authored high-impact journal publications and two book chapters in the area of biofuel economics and process modeling. His publications have been cited over 148 times in the literature (h-index 5).

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.