

## **CAN THE BIOREFINERY SURVIVE CHEAP OIL? APPROACHES TO HIGH VALUE CHEMICAL PRODUCTS FROM CARBOHYDRATES AND LIGNIN**

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Suggested session: Oral presentation, feedstock conversion (development of coproducts)

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The economic viability of the petrochemical industry is predicated on the simultaneous production of chemicals and fuels. High volumes of low value fuel address the strategic energy needs of the US, while low volumes of high value chemicals provide the industry's critical economic foundation. This operational model would be ideal for the growing biorefining industry. But even after years of effort, biofuels remain the biorefinery's primary focus, as the breadth and sophistication of technology for biobased chemical production lags far behind that of the petrochemical industry. The recent precipitous drop in oil prices and the development of new sources of non-renewable raw materials further threatens to marginalize the biofuel industry as a minor player in energy production. In response to these challenges, Sun Grant funding has supported and leveraged key efforts to develop technology tailored for the conversion of renewable building blocks (carbohydrates and lignin) to high value chemicals able to provide economic support for biofuel production. For example, our program has demonstrated that solvent fractionation provides rapid and efficient access to the primary biopolymeric components of bioenergy crops as process streams for chemical production. New organometallic catalysts based on Co, Fe and Re enable synthetic transformations that accommodate the identical functional groups in carbohydrates, or that are able to navigate the multiple substructural units present in lignin. Hybrid chemical/biochemical methodology is used to generate new platform chemicals from biorefinery sugars, and subsequently transform them into new biobased polymers and materials. We will overview this work and discuss how its inclusion within a larger fuel/chemical production scenario can help enable a successful and viable biorefining industry.