

## **SESSION 5**

### **Bioprocessing and Separations R&D**

## **Introduction to Session 5**

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Production of bio-based products that are cost competitive in the market place requires well-developed operations that include innovative processes and separation solutions. Separations costs can make the difference between an interesting laboratory project and a successful commercial process. Bioprocessing and separations research and development addresses some of the most significant cost barriers in production of bio-fuels and bio-based chemicals. Models of integrated biorefineries indicate that success will require production of higher volume fuels in conjunction with high margin chemical products. Addressing the bioprocessing and separations cost barriers will be critical to the overall success of the integrated biorefinery.

Production of fuels and chemicals offers distinct technical challenges in comparison with related fields. In pharmaceuticals, high-valued products can support complex and expensive separation processes. In petrochemicals, product concentrations are typically significantly higher than possible with aqueous fermentations. The field has focused on technologies such as designing bioreactors to facilitate product recovery, or development of novel membrane materials and technologies that reduce the energy burden in separating dilute aqueous products. Modeling and simulations have played

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strong roles is designing new processes and evaluating their potential performance. Session 5 included oral presentations on scaling up fed-batch processes, innovative membrane bioreactors and product recovery systems, evaluation of processes to extract products from wood pulping, and mathematical models and CFD simulations of reactors and fermentations.

The poster session described a wide variety of projects including production of ethanol and organic acids, sugar separations, pretreatment, esterification of organic acids, anaerobic digestion, biodegradation, fatty acid and biodiesel production, utilization of coproducts, new materials, strains, catalysts, processes, and simulations to improve fermentations, and so on. In addition, bioprocessing and separations of different biomass sources was presented in several posters. What is apparent is that the field is open and has drawn the attention of international distribution of researchers from microbiologists through chemical engineers. There is no single bullet, but a suite of technology solutions that are developing. Some will be valuable for large volume products such as ethanol whereas others will have specific product or feedstock niches. The work directly addresses some of the most significant cost barriers to production of fuels and chemicals from biomass.