

5th Annual AIChE Midwest Regional Conference

January 31st – February 1st, 2013

Organized by the Chicago Local Section of the AIChE
Hosted by the Illinois Institute of Technology, Chicago, IL

Session Fr1A: 10:00am -11:30am, Friday February 1, 2013 (Armour Dinning)

Renewables Research

Session Organizer: James J. Foster, Archer Daniels Midland Co.

Session Chair: James J. Foster, Archer Daniels Midland Co.

10:00am: Progress Report on Integrated BioRefinery

Josef Schmid, Archer Daniels Midland Co.

For some biorefineries a single product is the goal of the project. Sometimes it is ethanol or an oil or perhaps a select chemical compound, but it is focused on optimizing one product that will make or break the project. While sometimes it is good to be focused, it can lead to tunnel vision that can prematurely crash a project. We believe a better method is run the biorefinery as having a number of co-products which allow multiple outlets for the different natural fractions of biomass. In our current biomass project, partially funded by the Department of Energy, we can produce ethanol, butyl acrylate, fiber and lignin. Butyl acrylate can be used as a drop in replacement for current petroleum based acrylates, lignin can be used as a fuel source for power or steam generation, and the fibers can be used as a feedstock for further conversion or sold as animal feed. As part of the presentation we will list some of the challenges with the start-up of the pilot plant and the concerns of building a full scale plant including the technical issues and regulatory issues.

10:20am: Investigation of the Production of Hydroxymethylfurfural as a Bio-based Platform Chemical

April Hoffart, Archer Daniels Midland Co.

Hydroxymethylfurfural (HMF) is a chemical receiving a lot of attention in industry research. The reason for the attention is its usefulness as both a platform chemical and a fuel additive coupled with its ability to be synthesized from biomass sources. While HMF is often considered an unwelcome contaminant in food processing involving high heat, research focus had begun to shift to the purposeful production of HMF by similar methods. Produced via the acid catalyzed dehydration of hexoses, HMF shows value in the fuel, polymer, and pharmaceutical industries for the production of bio-based alternatives to current petroleum-based products. Research assessments of production methods of HMF involve a wide variety of reaction and separation solvents, acids and reaction mechanisms, many of which prove to have a marked effect on reaction yield and selectivity. In addition, selection and design of downstream purification processes can ultimately determine the economic viability of the commercial production of HMF.

10:40am: Building Blocks for a Renewable Chemical Industry

José Leboeiro, Ph.D., Archer Daniels Midland Co.

The petrochemical industry relies on a relatively small number of hydrocarbon building blocks to produce chemical compounds for a large number of applications; these blocks are methane, ethylene, propylene, butanes, butadiene, benzene, toluene and xylenes. A similar approach has to be developed to expand the use of chemicals from renewable resources. Significant progress has been made by the scientific community to identify building blocks from renewable resources. ADM is working to develop processes for renewable chemicals based on the building block approach; several examples will be presented.

11:00am: Energy Reduction & Advanced Water Removal via Membrane Solvent Extraction Technology

Rhea Sammons, Ph.D., Archer Daniels Midland Co.

ADM is currently participating in a cooperative project with the Department of Energy and 3M on the development of a pilot scale facility that will demonstrate and validate ethanol recovery through membrane solvent extraction (MSE). The key goal of this project is to prove that the MSE process can efficiently reduce the energy and water consumption of a conventional ethanol fermentation process. The project will also test the feasibility of accelerating the fermentation to reduce retention time and increase ethanol yield. This presentation will give an overview of the MSE process and the potential impact it will have on production scale ethanol plants.