

# CPAC Summer Institute 2016

## Next Generation Process Development Approaches Which Will Enable Truly Sustainable Chemical and Biomass Processing

To help achieve that goal the meeting will explore the following aspects of biomass processing.

- Adaptation of the concepts of molecule management and smart manufacturing to enable extraction of the full value of biomass and specialty chemicals.
- Next generation continuous manufacturing concepts, including fermentation strategies from organism preparation and isolation to nutrient optimization and infusion followed by continuous product separation and purification.
- New process intensification approaches for both preprocessing of ligno-cellulosic biomass to enable cost effective preparation of feedstocks, and for the high selectivity conversions to valuable platform chemicals.
- Recent advances in process analytical technology, PAT, for the real time characterization of raw materials, as well as the complex biomass streams for process understanding. This data can be used for rapid process development and for feed forward and feedback control among other things enabling more cost effective processing.
- Utilization of approaches to handling big data - for end to end understanding and value extraction from chemical and biomass processing.

The three day schedule ends on Thursday evening with a BBQ dinner off-site event. The final afternoon will summarize the technical areas and meld the conclusions into a broader look at the future impact of Process Analytical Technology (PAT) for achieving Process Optimization. CPAC has an established track record in fostering academic/industrial/national laboratory interactions, which aims at bridging the gap between basic research and full-scale process/product development. CPAC's Summer Institute will provide continuing education opportunities in the areas of advances in measurement science linked to process control.

# Process Characterization Leading to Process Optimization

July 19-21, 2016

University of Washington, Seattle, WA

## Draft Agenda

### Tuesday, July 19, 2016 - UW Club

8:30	<b>Meeting Registration Desk Opens</b> – University of Washington Club, UW
9:00-9:05	<b>Meeting Welcome</b> Brian Marquardt, CPAC Director, Applied Physics Laboratory, UW
9:05-9:15	<b>Introduction to the Summer Institute Theme</b> Mel Koch, CPAC, APL, UW
9:15- 9:50	<b>Advances in Understanding Bio-Fermentation- ‘RAPT (Reversible Acid PreTreatment) for Cellulosic Ethanol Production</b> Paul Weider, Shell Oil Company
9:50-10:20	<b>Expected Technology Directions in the Biomass to Chemicals Markets</b> Ray Chrisman, consultant to the Iowa Corn Board
<b>10:20-10:35</b>	<b>Break</b>
10:35-11:15	<b>The Use of Multi-Step Continuous Manufacturing to Enable Sustainable Synthesis in Emerging Markets</b> Paul Watts, Nelson Mandela University, South Africa
11:15-11:45	<b>What's Next? The Changing Role of Chemometrics and Instrumentation for Process Analytics</b> Brian Rohrback, InfoMetrix, Inc.
11:45-12:10	<b>Introduction of Meeting Participants and Discussion</b>
12:10-1:15	<b>Lunch (UW Club)</b>
1:15-1:30	<b>Update on CPAC Activities</b> Mel Koch, CPAC, UW
1:30-2:10	<b>Novel Extraction System</b> Andrea Adamo, Zaiput
2:10-2:45	<b>Optimization of Acetic Acid Production during Conversion of Hybrid Poplar to Jet Fuel by Detoxification of Sugar</b>

	<b>Streams using Carbon Nanotubes</b> Renata Bura and Rick Gustafson, UW Forest Resources
2:45-3:00	<b>Break</b>
3:00-3:25	<b>Battery-Free RF Energy Harvesting Gas Sensing Platform</b> Josh Smith, UW Electrical Engineering and Computer Sciences
3:25-3:50	<b>Novel Analytical Workflow for Comprehensive <sup>13</sup>C-metabolic Flux Analysis using GC-TOFMS and Chemometrics</b> Rob Synovec and Brooke Reaser, UW Chemistry
3:50-4:35	<b>Developments in Benchtop NMR Spectroscopy</b> Mark Kemper, Magritek
4:35-5:00	<b>High-dimensional Process Monitoring and Change Point Detection using Embedding Distributions in Reproducing Kernel Hilbert Space (RKHS)</b> Shuai Huang, UW Industrial and Systems Engineering
5:00-5:30	<b>Discussion</b>
6:00	Dinner at Ivar's Salmon House

## Wednesday, July 20, 2016 - UW Club

8:30-9:00	<b>Registration</b>
9:00-9:10	<b>Daily Overview</b> Mel Koch, CPAC, Applied Physics Laboratory (APL), UW
9:10-9:40	<b>Advances in Sampling and the Use of PAT for Developments in Process Control for Bio-Manufacturing</b> Brian Marquardt and Sergey Mozharov Applied Physics Lab (APL), UW
9:40-10:10	<b>Polarization-Sensitive Terahertz Spectroscopic Imaging for Non-destructive Testing Applications</b> Hassan Arbab, Applied Physics Lab (APL), UW
10:10-10:30	<b>Break</b>
10:30-11:05	<b>Dielectric Sensors</b> Alex Mamishev. UW Electrical Engineering
11:05-11:40	<b>Advances in Separations Technology - How it's been</b>

	<b>incorporated into the PAT Toolkit</b> Ernie Hillier, Waters
11:40-12:00	<b>Discussion</b>
12:00-1:15	<b>Lunch</b> (UW Club)
1:15-1:45	<b>Recent Advances in Valve-Based Two-Dimensional Gas Chromatography</b> Chris Freye and Rob Synovec, Chemistry, UW
1:45-2:15	<b>SQL-Centric Automated Chemometrics and Distributed Display</b> Michael Roberto, InfoMetrix
2:15-2:45	<b>Data Visualization</b> Sandlin Seguin, Tableau
2:45-3:00	<b>Break</b>
3:00-3:30	<b>Novel 3D Chemical Imaging System for Characterization of Tablets, Complex Powders and Liquids</b> <b>Rudy Hofmeister, H2Optx</b>
3:30-4:00	<b>Investigation of the Use of Laser Induced Breakdown Spectroscopy (LIBS) as an Effective Process Analysis Tool</b> Brian Marquardt and Sergey Mozharov, Applied Physics Lab UW
4:00-4:30	<b>Motor Fuel Property Prediction by Inferential Spectrometry 3. Hard and Soft Realities of Measuring Olefins in Gasoline</b> Marc Trygstad, Yokagawa

## Thursday, July 21, 2016 - Lake Kachess Clubhouse

10:15-10:45	<b>Applications of Advances in Separation Technology</b> Ludo Diels, VITO, Belgium
10:45-11:15	<b>Jettisoning Chemometrics to Solve Multivariate Problems in Chemical Analysis</b> Marc Trygstad, Yokagawa
11:15-11:45	<b>Microfluidics coupled to mass spectrometry for ultra-small volume sample analysis</b> Ryan Kelly, PNNL
11:45-12:30	<b>Lunch</b>

12:30-1:00	<b>Design of Portable Surface Plasmon Resonance (SPR) Based Assays for Small and Large Analytes</b> Clement Furlong and Scott Soelberg, Medical Genetics and Genome Sciences, UW Medicine
1:00-1:30	<b>The Impact of Chromatographic Alignment,</b> Brian Rohrback, Infometrix
1:30-2:00	<b>Nuclear magnetic resonance for process analysis</b> Michelle Martin, Matt Augustine, Chemistry, U C Davis
2:00-2:30	<b>Selected Topics Discussed at the 2016 CPAC Rome Workshop that are Related to the Summer Institute Theme</b> Ray Chrisman, MK Optimization and Control
2:30-3:30	<b>Final Discussion, Summary, and Development of Action Plans</b>
3:30-4:00	<b>Reception</b> at Local Cabin
5:00	<b>BBQ Dinner</b>