



# Frontiers in Biorefining

*Chemicals and Products  
from Renewable Carbon*

## 2022 International Conference

St. Simons Island, Georgia, USA

October 24 - 27

### Steering Committee Members

**Nicole (Niki) Labbé**  
**Jessica McCord**  
**Timothy Rials**  
**Priya Voothuluru**  
**Nourredine Abdoulmoumine**  
**Julie Carrier**  
The University of Tennessee

### Advisory Board Members

**Jie Bao**  
East China University of Science and  
Technology  
**Gregg Beckham**  
National Renewable Energy Laboratory  
**Linda Broadbelt**  
Northwestern University  
**Jennifer Sinclair Curtis**  
University of California, Davis

**Silvio Vaz Junior**  
Embrapa, Brazilian Agricultural  
Research Corporation

**Roberto Rinaldi**  
Imperial College London

**Wilfred Vermerris**  
University of Florida

Hosted By:



Sponsored By:



# CONFERENCE SCHEDULE

MONDAY OCTOBER 24, 2022

6:00pm-8:00pm Registration/Social Hour

TUESDAY OCTOBER 25, 2022

6:45am-7:45am Registration/Breakfast and Welcome

## Plenary Session:

### Biorefining and the Circular Economy

8:00-8:10 **Timothy Rials** (*The University of Tennessee*) Welcome and Opening Remarks

8:10-8:55 **John Ralph** (*University of Wisconsin*) Designing biomass lignins for the biorefinery

8:55-9:40 **Amit Naskar** (*Oak Ridge National Laboratory*) Lignin as a multifunctional feedstock for high-performance polymeric products

9:40-10:25 **Kenneth Reardon** (*Colorado State University*) Electro-fermentation for enhanced product yields

### 10:25am-10:55am Coffee Break

10:55-11:40 **Peter Ciesielski** (*National Renewable Energy Laboratory*) Multiscale modeling for conversion and catalytic upgrading of lignocellulosic biomass

11:40-12:25 **Basudeb Saha** (*RiKarbon, Inc.*) Catalytic hydrodeoxygenation of biomass substrates to SAF and synthetic lubricants

12:30pm-2:00pm **Lunch** **Chris Tindal** (*Commercial Aviation Alternatives Fuels Initiative*)  
Opportunities in the Sustainable Aviation Fuel (SAF) Industry

## Session 2A:

### Biosynthesis and Deconstruction of Plant Cell Walls

2:00-2:30 **Timothy Tschaplinski** (*Oak Ridge National Laboratory*)  
Metabolomics identifies the bases of low biomass recalcitrance of high productivity black cottonwood (*Populus trichocarpa*) natural variants

2:30-3:00 **Fredy Altpeter** (*University of Florida*) Towards oilcane: field evaluation of metabolically engineered energy cane for hyperaccumulation of triacylglycerol

3:00-3:30 **Laura Bartley** (*Washington State University*) Expected and Surprising Genetic Features of Switchgrass Cell Wall Digestibility

### 3:30pm-3:45pm Coffee Break

3:45-4:15 **Priya Voothuluru** (*The University of Tennessee*) Bark structural and compositional features differentially impact yield and disease tolerance in different hybrid poplar taxa

4:15-4:45 **Wellington Muchero** (*Oak Ridge National Laboratory*) Population-level genomics enable bioengineering of biomass cell wall properties and sustainability traits

4:45-5:10 *Flash Talks (5 min per talk)*

**Javier Abraham Hernandez-Diaz** (*Auburn University*)  
Downed timber in South Alabama: a study on degradation timeframe of Loblolly pine and recovery of natural polymers

**Ross Houston** (*The University of Tennessee*) Generation of a reaction mechanism for a model lignin tetramer by combining density functional theory and thin-film pyrolysis

**Raul Rinken** (*Imperial College London*) Soft mechanocatalytic pretreatments enhance monophenolics yields of reductive catalytic fractionation of poplar wood

**Wei Yi** (*Auburn University*) Wireless humidity sensors based on cellulose nanofiber-magnetostriuctive particle platform

**Skye Li** (*The University of Tennessee*) Selective depolymerization of lignin into aromatic monomers and dimers with nickel/iron metal organic framework catalyst

## Session 2B:

### Integrated Conversion Technologies

2:00-2:30 **Zhaohui Tong** (*Georgia Institute of Technology*) Reinforcement learning-based sustainable process control under feedstock uncertainty

2:30-3:00 **Bernard Baffour Asare Bediako** (*The University of Tennessee*) Ionic liquid-enhanced hydrocarboxylation of biomass-based polyols with CO<sub>2</sub> and H<sub>2</sub> to carboxylic acids

3:00-3:30 **Abby Engelberth** (*Purdue University*) Upcycling spent railroad ties into a value-added biochar

### 3:30pm-3:45pm Coffee Break

3:45-4:15 **Kalavathy Rajan** (*The University of Tennessee*) Strategy for a complete utilization of lignocellulosic feedstocks

4:15-4:45 **Marcin Łukaszewicz** (*University of Wrocław, Poland*) Zero waste biorefinery based on food-grade by-products, GRAS microorganisms simultaneously producing multifunctional feed ingredients and cosmetic products encapsulated in smart delivery systems

4:45-5:10 *Flash Talks (5 min per talk)*

**Danielle Bartholet** (*Colorado State University*) Electro-enhanced anaerobic digestion for the production of high-value chemicals

**Shaikat Chandra Dey** (*North Carolina State University*) Catalytic conversion of bio-oil into rechargeable battery anode

**Conner Pope** (*The University of Tennessee*) Investigating the effect of crystallite size on MOF/AB composite synthesis for CO<sub>2</sub> adsorption

**Robson Schuarca** (*Syracuse University*) Kinetic analysis of CO methanation on Sn promoted Pt/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalysts

**Jindong Wei** (*Auburn University*) All-organic composites with ultrahigh energy storage density and excellent flexibility

## TUESDAY OCTOBER 25, 2022

### 5:10pm-8:30pm Reception, Group Picture, and Poster Session

**Danielle Bartholet** (*Colorado State University*)

Electro-enhanced anaerobic digestion for the production of high-value chemicals

**Shaikat Chandra Dey** (*North Carolina State University*)

Catalytic conversion of bio-oil into rechargeable battery anode

**Javier Abraham Hernandez-Diaz** (*Auburn University*)

Downed timber in South Alabama: a study on degradation timeframe of Loblolly pine and the recovery of its natural polymers

**Ross Houston** (*The University of Tennessee*)

Generation of a reaction mechanism for a model lignin tetramer by combining density functional theory and thin-film pyrolysis

**Amber Kinnebrew** (*Tuskegee University*)

A facile method for the direct anchoring and dispersal of metallic nanoparticles in cellulose networks and application as gas separation membranes

**Skye Li** (*The University of Tennessee*)

Selective depolymerization of switchgrass lignin into aromatic monomers and dimers with nickel/iron metal organic framework catalyst

**Luna Liang** (*The University of Tennessee*)

Synthesis of bio-polycarbonates from carbon dioxide and bio-based feedstocks to value-added polymers

**Zahra Naghizadeh Mahani** (*Auburn University*)

Nanocellulose-reinforced epoxy composites

**Conner Pope** (*The University of Tennessee*)

Investigating the effect of crystallite size on MOF/AB composite synthesis for CO<sub>2</sub> adsorption

**Raul Rinken** (*Imperial College London, United Kingdom*)

Soft mechanocatalytic pretreatments enhance monophenolics yields of reductive catalytic fractionation of poplar wood

**Robson Schuarca** (*Syracuse University*)

Kinetic analysis of CO methanation on Sn promoted Pt/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalysts

**Phoenix Tiller** (*North Carolina State University*)

Scaling up selective ash removal from paper sludge for jet fuel valorization

**Jindong Wei** (*Auburn University*)

All-organic composites with ultrahigh energy storage density and excellent flexibility

**Wei Yi** (*Auburn University*)

Wireless humidity sensors based on cellulose nanofiber-magnetostrictive particle platform

**Kailong Zhang** (*The University of Tennessee*)

Sulfonated cellulose nanofibers templated metal-organic frameworks for the rapid dye removal

**Zhongjin Zhou** (*The University of Tennessee*)

Development of energy-efficient and water saving mechanical grinding method for the production of nanolignin

## WEDNESDAY OCTOBER 26, 2022

### 7:15am-8:15am Breakfast

#### Session 3A: Polymers and Soft Materials

- 8:30-9:00 **Jonathan Brantley** (*The University of Tennessee*) New methods and materials to address polymer sustainability
- 9:00-9:30 **Rebecca DiPucchio** (*National Renewable Energy Laboratory*) Model compound-driven chemical deconstruction of amine epoxies towards an open-loop monomer and carbon fiber recovery system

#### Session 3B: Sustainable Aviation Fuels

- 8:30-9:00 **Burton English** (*The University of Tennessee*) Where are the feedstocks and how much do they cost?
- 9:00-9:30 **Tim Theiss** (*Oak Ridge National Laboratory*) Sustainable aviation fuel (SAF) feedstock availability based on the "Billion-Ton" report



## WEDNESDAY OCTOBER 26, 2022

9:30-10:00 **Frederick Baddour** (*National Renewable Energy Laboratory*) Advances in the synthesis of nanostructured metal carbides via mild solution-phase and thermolytic decomposition routes for CO<sub>2</sub> conversion

### 10:00am-10:30am Coffee Break

10:30-11:00 **Mi Li** (*The University of Tennessee*) Antimicrobial food packaging with cinnamaldehyde stabilized by ethyl lauroyl arginate and cellulose nanocrystals

11:00-11:30 **Susan Habas** (*National Renewable Energy Laboratory*) Spectroscopic insight into carbon speciation and removal on a Cu/BEA catalyst during renewable high-octane hydrocarbon synthesis

11:30-12:00 **Oluwafemi Oyedeji** (*Oak Ridge National Laboratory*) Value-added biocomposite production using off-spec biomass from mechanical fractionation

9:30-10:00 **Ross Houston** (*The University of Tennessee*) Lignin-based sustainable aviation fuel: pathways, opportunities, and challenges

### 10:00am-10:30am Coffee Break

10:30-11:00 **Karthikeyan Ramasamy** (*Pacific Northwest National Laboratory*) Alcohols (C1-C4) role in the sustainable aviation fuel

11:00-11:30 **Jeffrey Linger** (*National Renewable Energy Laboratory*) Process integration for the production of sustainable aviation fuel precursors

11:30-12:00 **Daniel Ruddy** (*National Renewable Energy Laboratory*) Direct conversion of CO<sub>2</sub>-rich syngas to hydrocarbons in a single reactor

### 12:00pm-1:30pm Lunch

#### Session 4A: Lignin Valorization

2:00-2:30 **Kalavathy Rajan** (*The University of Tennessee*) Empirical advancement of lignin application in photopolymers and stereolithography resins

2:30-3:00 **Thomas Elder** (*USDA-Forest Service*) The application of *in silico* methods to the plasticity of lignification

3:00-3:30 **David Harper** (*The University of Tennessee*) Controlled design of carbon materials from lignin for electrochemical energy storage and other high-value applications

3:30-4:00 **Wilfred Vermerris** (*University of Florida*) Biomedical applications of biorefinery lignin

#### Session 4B: Carbohydrates Valorization

2:00-2:30 **Xuejun Pan** (*University of Wisconsin-Madison*) Molten salt hydrates as unique solvents for biorefining

2:30-3:00 **Siqun Wang** (*The University of Tennessee*) How to convert cellulose and hemicellulose of biomass into nanomaterials

3:00-3:30 **Stephen Chmely** (*Pennsylvania State University*) Engineered nanointerfaces to enable plant-inspired 3D printing using renewable materials

3:30-4:00 **David Johnson** (*National Renewable Energy Laboratory*) Conversion of biomass-derived intermediates to paraffins for blending into jet or diesel fuels

### 7:00pm-9:00pm Conference Dinner

Keynote speaker: **Amy McCrae Kessler** (*Pennsaco Technologies*)

The importance of bioenergy with carbon capture & storage in meeting global 2050 climate goals

## THURSDAY OCTOBER 27, 2022

### 6:45am-7:45am Breakfast

#### Plenary Session: Pushing the Frontiers of Biorefining

8:00-8:45 **Gerald Tuskan** (*Oak Ridge National Laboratory*) Creating a path forward to reach the US grand challenge for sustainable aviation fuel

8:45-9:30 **Nourredine Abdoulmoumine** (*The University of Tennessee*) Pushing the boundary of biomass fast pyrolysis' chemistry through combined computational and experimental approaches

9:30-10:15 **Roberto Rinaldi** (*Imperial College London, United Kingdom*) Pushing the frontiers of lignin valorization

### 10:15am-10:45am Coffee Break

10:45-11:30 **Andrew Sutton** (*Oak Ridge National Laboratory*) Challenges in the science and engineering of economical production of SAF

11:30-12:15 **Katrina Knauer** (*National Renewable Energy Laboratory*) Bioplastics, circular economy and closing the loop in the bioeconomy