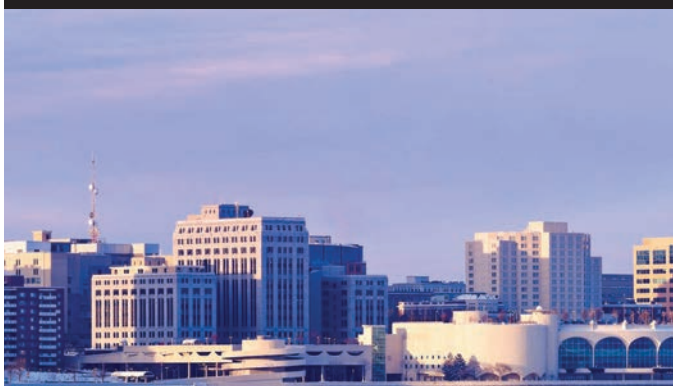




# Advancements in Fiber-Polymer Composites Symposium

May 16-18, 2017, Madison, WI USA



Cellulose Nanofibrils  
Cellulose Nanofibrils  
**Cellulose Nanofibrils**  
Cellulose Nanofibrils

— 1 cm

## SYMPOSIUM GUIDE



Thank You to Our Sponsors

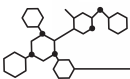
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## Platinum



J. RETTENMAIER USA LP

## Silver



# Welcome

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Welcome to Madison!

On behalf of the USDA Forest Products Lab and Forest Products Society we are pleased to welcome you to the 2017 Advancements in Fiber-Polymer Composites Symposium.

This meeting is dedicated to the exchange of information about the development of the wood-plastic composites industry and especially nanocellulose composites. We'll learn about the new generation of composites being developed as material behavior is better understood, process and performance are improved, and new opportunities are identified. You will enjoy hearing in depth how one industry, autos, is embracing the use of composites. I would like to personally thank all speakers, session chairs, and especially the organizing committee who volunteered their time and talents to provide you with an excellent technical program. Most of all, I thank FPS members and the rest of you for attending.

We encourage you to make the most of the symposium. Please take advantage of the networking opportunities during the sessions and breaks, especially the poster session Wednesday night.

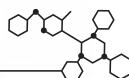
Given the high demand on everybody's time and resources, we appreciate you being here. Enjoy Madison!

## Conference Co-Chairs

Dr. Nicole Stark



Dr. Zhiyong Cai



# Hotel Floorplan

## THE MADISON CONCOURSE HOTEL 2nd Floor

### The Madison Concourse Hotel

One West Dayton Street  
Madison, Wisconsin 53703  
800-356-8293

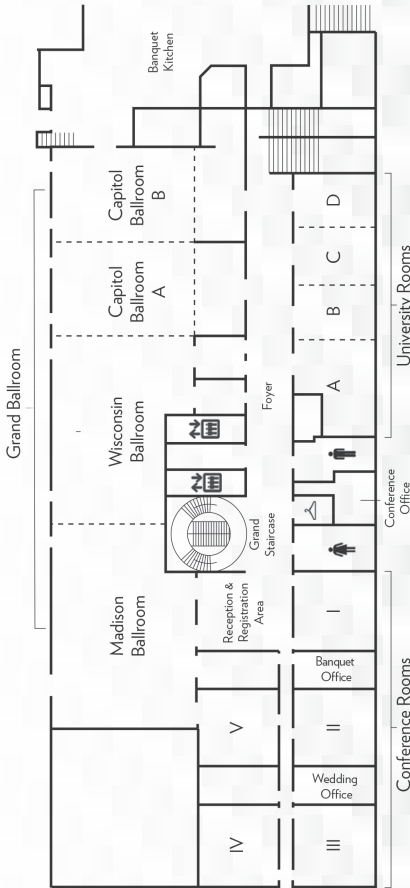
### Check-in and Check-out Time

Check-in time is 3:00 p.m.

Check-out time is 11:00 a.m.

### Parking

The current rate is \$1.50 per hour up to a maximum of \$17 per day. The rate for overnight guests is \$10. Additional parking facilities are located within one block of the hotel.



## Schedule of Events

### Tuesday May 16

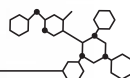
Time	Event	Room
7:00 am - 8:00 am	Registration	2nd Floor Foyer
8:30 am - 3:15 pm	Cellulose Nanocomposites Workshop**	Forest Products Lab* Room 501
3:30 pm - 4:30 pm	Tour of Cellulose Nanocrystal Pilot Facility	Forest Products Lab Lobby*
3:00 pm - 6:00 pm	Registration	2nd Floor Foyer

### Wednesday May 17

Time	Event	Room
8:00 am - 5:00 pm	Registration	2nd Floor Foyer
8:00 am - 9:00 am	AM Coffee	Wisconsin Ballroom
9:00 am - 10:45 am	Plenary	Capitol Ballroom A
10:45 am - 11:15 am	AM Break	Wisconsin Ballroom
11:15 am - 12:00 pm	Plenary continued	Capitol Ballroom A
12:00 pm - 1:30 pm	Lunch	Madison Ballroom
1:30 pm - 3:00 pm	Session 2A	Capitol Ballroom A
	Session 2B	University AB
3:00 pm - 3:30 pm	PM Break	Wisconsin Ballroom
3:30 pm - 4:30 pm	Session 2A	Capitol Ballroom A
	Session 2B	University AB
4:30 pm - 6:00 pm	Poster Session	Wisconsin Ballroom

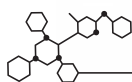
\* shuttle from the hotel lobby departs at 8 am, returns by 5 pm

\*\* additional registration required



## Schedule of Events

<b>Thursday May 18</b>		
<b>Time</b>	<b>Event</b>	<b>Room</b>
8:00 am - 12:00 pm	Registration	2nd Floor Foyer
8:00 am - 8:30 am	AM Coffee	Wisconsin Ballroom
8:30am-10:00pm	Session 4A	Madison Ballroom
	Session 4B	University AB
10:00 am - 10:30am	AM Break	2nd Floor Foyer
10:30 am - 12:00 pm	Session 4A	Madison Ballroom
	Session 4B	University AB
12:00 pm - 1:30 pm	Lunch on Own	
1:30 pm - 3:00 pm	Session 5A	Madison Ballroom
	Session 5B	University AB
3:00 pm - 3:30 pm	PM Break	2nd Floor Foyer
3:30 pm - 4:30 pm	Session 5A	Madison Ballroom
	Session 5B	University AB



# Plenary Session

Wednesday, May 17th  
Capitol Ballroom A



**9:00 am - 9:15 am**

**Welcome and Introductions**  
**Nicole Stark**

Research Chemical Engineer  
*USDA Forest Service, Forest Products Laboratory*



**9:15 am - 10:00 am**

**“Transformation of the Automotive Sector: Lightweighting and Biocarbon”**

**Mohini Sain**

Dean & Professor  
*University of Toronto, Faculty of Forestry*



**10:00 am - 10:45 am**

**“Driving the Automotive Industry Using Sustainable Materials”**

**Alper Kiziltis**

Research Scientist,  
*Ford Motor Company*

**10:45 am - 11:15 am: Break**

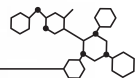


**11:15 am - 12:00 pm**

**The Continuing Rise of Wood-Plastic Composite Decking In North America**

**Peter Kotiadis**

Executive Director of Research & Product Development  
*Fiberon Decking*



# Program

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## Wednesday, May 17th

9:00 am - 9:15 am

**1 - Plenary Session**  
**Capitol Ballroom A**  
Conference Chair: **Nicole Stark**,  
*USDA Forest Products Laboratory*

9:15 am - 10:00 am

**Transformation of the Automotive Sector: Lightweighting and Biocarbon**  
**Mohini Sain**, *University of Toronto, Faculty of Forestry*

10:00 am - 10:45 am

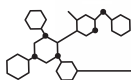
**Driving the Automotive Industry Using Sustainable Materials**  
**Alper Kiziltis**, *Ford Motor Company*

10:45 am - 11:15 am **Break**

11:15 am - 12:00 pm

**The Continuing Rise of Wood-Plastic Composite Decking In North America**  
**Peter Kotiadis**, *Fiberon Decking*

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





1:30 pm - 4:30 pm

## 2A: Beyond Decking - Other Applications for Wood-Plastic Composites

*Capitol Ballroom A*

Session Chair: **Alper Kiziltis**, *Ford Motor Company*

- 2A.1 The Potential of Torrefied Fibers for Wood-Polymer Composites  
**Ramzi Ayadi**, *Université du Québec en Abitibi-Témiscamingue*
- 2A.2 Viability of Up-Cycling Wood Furniture Waste to 3-D Printing Filament  
**Mark Rudnicki**, *Michigan Tech University*
- 2A.3 Plastic Biocomposites Based on Cellulose Filament Technology  
**Gurminder Minhas**, *Performance BioFilaments Inc*

3:00 pm - 3:30 pm **Break**

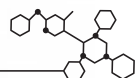
- 2A.4 Characterization of Engineering Grade Wood Plastic Composites and their Properties for High Performance Building, Structural, and Marine Applications  
**Yousoo Han**, *University of Maine*
- 2A.5 Use of Reinforcing Fillers from Natural Resources for Plastic Parts Used in Automotive Applications  
**Akshay Trivedi**, *Lear Corporation*

## 2B: Novel Cellulose Nanocomposites

*University AB*

Session Chair: **Kristiina Oksman**, *Luleå University of Technology*

- 2B.1 Nanofibrillated cellulose (NFC) reinforced bio-PU foam and its use as core material in sandwich panels  
**Kristiina Oksman**,  
*Luleå University of Technology*
- 2B.2 Xylan-lignin based aerogels and hydrogels reinforced with cellulose nanofibers  
**Linn Berglund**, *Luleå University of Technology*



# Program

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2.B.3 Optimization of Magnetostrictive Cellulose Nanofibril Composites  
**Andrew Thompson**, *UW Milwaukee Research Foundation*

3:00 pm - 3:30 pm **Break**

2B.4 Potential use of Crystalline Nanocellulose (CNC) to Reinforce Polyurethane in Slurry Pipe Liner Applications  
**John Wolodko**, *University of Alberta*

2B.5 Rubber Nanocomposites Reinforced by Cellulose Nanofibers  
**Long Jiang**, *North Dakota State University*

4:30 pm - 6:00 pm

**3 - Poster Session**  
*Wisconsin Ballroom*

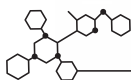
1 Directed Deposition of Cellulose Nanocrystals for Selective Polymer Property Enhancement  
**Jane O'Dell**, *Forest Products Laboratory*

2 The Effects of Various Mineral Nanofillers on Morphology, Surface Chemistry and Thermal Properties of HDPE Nanocomposites  
**Ahmed Koubaa**, *Ecole Preparatoire des Xcience et de la Technologie  
Alger- USTHB - UQAT*

3 Sustainable Development - International Framework - Overview and Analysis in the Context of Forests and Forest Products - Policy with Business  
**Annika Hyyti**, *University of Helsinki*

4 Improving the Moisture-Durability of Forest Products Using Small Angle Neutron Scattering  
**Nayomi Plaza**,  
*University of Wisconsin Madison*

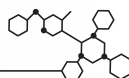
5 Effect of Compatibilization on Mechanical and Moisture Absorption Properties of Biobased Polymer Composites  
**Nikushi Yatigala**, *North Dakota State University*



4:30 pm - 6:00 pm

**3 - Poster Sessions continued**  
**Wisconsin Ballroom**

- 6      Production of Cellulose Nanofibers and Nanocomposites  
**Alexander Sinclair**, *North Dakota State University*
- 7      Development of Bio-based Wood Adhesive by Using Cellulose Nanofiber Reinforcement and Crosslinking Agent for Improved Bonding Strength  
**Myungkeun Oh**, *North Dakota State University*
- 8      Using Agricultural Residuals to Prepare Nanomaterials/Composites for Energy Storage Applications  
**Yong Wang**, *North Dakota State University*
- 9      Magnetostrictive Properties of Nanocellulose Terfenol-D Film Composite  
**Andrew Thompson**, *University of Wisconsin - Milwaukee*



# Program

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## Thursday, May 18th

8:30 am - 12:00 pm

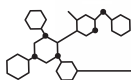
### 4A: Wood-Polymer Composites in External Applications *Madison Ballroom*

Session Chair: **Wayne Song**, *Futuresoft, Inc.*

- 4A.1 Development of WPCs in China  
**Wayne Song**, *Futuresoft, Inc.*
- 4A.2 TBD  
**Toland Lam**, Wood Plastic Composite Council of China
- 4A.3 Building Code Requirements for WPC Deck Boards, Stair Treads, and Guard Systems: Past, Present, and Future  
**Mike Fischer**, *Composite Lumber Manufacturers Association*

10:00 am - 10:30 am **Break**

- 4A.4 Comparative Study in Wood Polymer Composites Based in High Density Polyethylene  
**Jorge Alberto Medina**, *Universidad de Los Andes*
- 4A.5 Durability of Wood-Plastic Composites, an Evolving Story  
**Gino Braiotta**, *U.S. Borax, Inc. /Rio Tinto Borates*
- 4A.6 Long Term Durability of Wood-Plastic Composites Made with Chemically Modified Wood  
**Rebecca Ibach**, *USDA Forest Service, Forest Products Laboratory*



## 4B: Cellulose Nanocomposite Preparation and Characterization

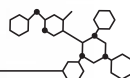
### University AB

Session Chair: **Ron Sabo**, USDA Forest Service, Forest Products Laboratory

- 4B.1 A Review of Various Approaches to Mix Cellulose Nanofibrils in Hydrophobic Thermoplastic  
**Doug Gardner**, *University of Maine*
- 4B.2 Towards Commercial Preparation of Composites from Cellulose Nanocrystals and Polypropylene: Drying, Dispersion, and Thermal Stability  
**Craig Clemons**, *USDA Forest Service, Forest Products Laboratory*
- 4B.3 Develop Polypropylene/Cellulose Nanocrystals Laminated Film for Flexible Barrier Packaging  
**Jinwu Wang**, *USDA Forest Service, Forest Products Laboratory*

10:00 am - 10:30 am **Break**

- 4B.4 Fabrication and Properties of Cellulose Nanofibril Aerogel/Epoxy Resin Nanocomposite foam with Crosslinked Structure  
**Jinghao Li**, *USDA Forest Service, Forest Products Laboratory*
- 4B.5 Preparation and Characterization of Hydroxyapatite-Poly (Vinyl Alcohol) Composites Reinforced with Cellulose Nanocrystals  
**Wei Song**, *Beijing Forestry University*
- 4B.6 Barrier Properties of Sustainable Bio-Plastic Filled with Cellulose Nanocrystals  
**Laurent Matuana**, *Michigan State University*



# Program

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12:00 pm - 1:30 pm **Lunch on Your Own**

1:30 pm - 4:30 pm

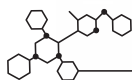
## **5A: Recent Progress in Wood-Plastic Composite Materials and Processing** **Madison Ballroom**

Session Chair: **Laurent Matuana**, *Michigan State University*

- 5A.1 Compounding Natural Wood Fiber and Powdered Cellulose into Polypropylene Plastic  
**Jim Preston**, *RheTech*
- 5A.2 Assessing Interfacial Bonding Behaviour Between Wood and Thermoplastics in Composite Materials  
**Jan Luedtke**, *Thuenen-Institute of Wood Research*
- 5A.3 Rheology of Wood Filled ABS Composites for Increased Range of Production Methods  
**Thomas Tarlton**, *Washington State University*

3:00 pm - 3:30 pm **Break**

- 5A.4 Preparation of Lignin-Clay Complexes and Its Effects on Properties and Weatherability of Wood Flour/Polypropylene Composites  
**Yao Peng**, *Beijing Forestry University*
- 5A.5 Effect of Heat Treatment of Wood Flour on the Water Absorption, Thickness Swelling and Impact Performance of LDPE/Red Balau Composites  
**Ruth Lafia-Araga**, *Federal University of Technology, Minna*



## 5B: Biopolymer Composites

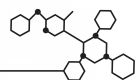
### *University AB*

Session Chair: **Nicole Stark**, *USDA Forest Service, Forest Products Laboratory*

- 5B.1 Transparent Nanocomposite Film from Transesterified Cellulose Nanocrystals and Poly (lactic acid) for Packaging Applications  
**Liqing Wei**, *USDA Forest Service, Forest Products Laboratory*
- 5B.2 Biodegradable Nanocomposites Films from Poly(Lactic Acid) and Cellulose Nanocrystals  
**Grant Kirker**, *USDA Forest Service Forest Products Laboratory*
- 5B.3 Improving Performance Characteristics of Poly (lactic acid) Polymer via Incorporating Functionalized Cellulose Nanocrystals.  
**Jamileh Shojaeiarani**, *NDSU*

3:00 pm - 3:30 pm **Break**

- 5B.4 Flexural Properties of PLA Composites Reinforced with Cotton Gin Wastes and Flax Fibers  
**Dilpreet Bajwa**, *North Dakota State University*
- 5B.5 Fabrication of Hydrophobic Cellulose Nanofibrils (CNF) Transparent Film Via Plasma Etching  
**Marcia Silva**, *University of Wisconsin-Milwaukee*



# Symposium Leadership

---

## Co-Chairs

### **Dr. Nicole Stark**

Research Chemical Engineer  
*USDA Forest Service, Forest Products Laboratory*  
One Gifford Pinchot Drive  
Madison, WI

### **Dr. Zhiyong Cai**

Supervisory Materials  
Research Engineer  
*USDA Forest Service, Forest Products Laboratory*  
One Gifford Pinchot Drive  
Madison, WI

## Workshop Chair

### **Dr. Ron Sabo**

Research Materials Engineer  
*USDA Forest Service, Forest Products Laboratory*  
One Gifford Pinchot Drive  
Madison, WI

## Planning Committee

### **Dr. Alper Kiziltas**

Research Scientist -  
Sustainable Biomaterials and  
Plastics  
*Ford Motor Company*  
Dearborn, MI

### **Dr. Dilpreet Bajwa**

Associate Professor,  
Mechanical Engineering  
*North Dakota State University*  
Fargo, ND

### **Dr. Laurent Matuana**

Professor  
School of Packaging  
*Michigan State University*  
East Lansing, MI

### **Dr. Kristiina Oksman**

Professor  
*Luleå University of Technology*  
Luleå, Sweden

### **Dr. Alan Rudie**

Assistant Director, Wood,  
Fiber & Composites Research  
*USDA Forest Service, Forest Products Laboratory*  
One Gifford Pinchot Drive  
Madison, WI

### **Dr. Wayne Song**

WPCC (Wood-Plastic  
Composite Council of China)  
*Futuresoft, Inc.*  
Mississauga, ON

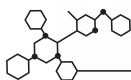
## FPS Staff

### **Deepa George**

Meeting Planner and  
Membership Coordinator  
Peachtree Corners, GA

### **Scott Springmier**

Executive Director  
Neenah, WI





# FPS Organization Members

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Thanks to these industry leaders for supporting the Forest Products Society

## Gold

APA-The Engineered Wood Association  
Arch Wood Protection  
FPInnovations  
Louisiana Forest Products Development Center/Ag Center  
Louisiana-Pacific Corp  
Ministry Of Natural Resources and Forestry  
TAPPI  
University of Tennessee Center for Renewable Carbon  
Weyerhaeuser Company

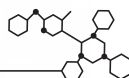
## Silver

Bright Wood Corp  
Composite Panel Association  
Natural Resources Research Institute (UM-Duluth)  
Southern Pine Inspection Bureau  
Tembec Inc

## Bronze

Alabama A&M University  
American Wood Council  
Armstrong Flooring Inc.  
Auburn University Forest Products Development Center  
Bandit Industries  
Evergreen Engineering  
Forest Products Laboratory Library  
Gilsanz Murray Steficek LLP  
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American Wood Fibers, an ISO 9001:2008 certified manufacturer of natural fiber products, is the leading supplier of fiber to the composites market. AWF products bring improved processing efficiencies and throughputs to client's facilities. These products include grades formulated specifically for Wood and Natural Fiber Composite applications. We also supply a variety of other markets with high quality products covering a wide range of applications.

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- Product options include hardwood, softwood and other agricultural fibers
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# 71<sup>st</sup> INTERNATIONAL CONVENTION

June 26-28, 2017  
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PRODUCTS  
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**June 26-28, 2017**  
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