



2801 Marshall Court  
Madison, WI 53705-2295 USA

9th International Conference on

# WOOD & BIOFIBER PLASTIC COMPOSITES

*May 21-23, 2007*

Monona Terrace Community  
and Convention Center  
Madison, Wisconsin, USA

9th International Conference on

# WOOD & BIOFIBER PLASTIC COMPOSITES



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Monona Terrace Community and Convention Center  
Madison, Wisconsin, USA

HOSTED BY THE USDA FOREST SERVICE, FOREST PRODUCTS  
LABORATORY AND FOREST PRODUCTS SOCIETY

*Register by May 7, 2007 and save \$75*

## INVITATION

Members of the Conference Planning Committee would like to invite you to attend the 9th International Conference on Wood & Biofiber Plastic Composites. The conference is hosted by the USDA Forest Service, Forest Products Laboratory and Forest Products Society. In cooperation with Luleå University of Technology, University of Tennessee, Centre for Biocomposites & Biomaterials Processing, University of Toronto, and IUFRO Composites & Reconstituted Products Division.

Since the first conference in 1991, the International Conferences on Woodfiber-Plastic Composites have brought together international experts from the scientific, technical, and commercial communities to encourage the exchange and dissemination of information on the latest advances and future opportunities for these materials. Alternating years with its Canadian counterpart, this biennial spring conference has evolved into the largest of its kind.

We will continue this tradition at the 9th International Conference, where a two-track format of formal presentations will explore the nature, structure, performance, markets and issues concerning wood and biofiber plastic composites. Please join us for this important International Conference.

## WHO SHOULD ATTEND

The conference will be of direct benefit to those involved in the growing wood and biofiber plastic composites industry including:

- Researchers and educators
- Suppliers of wood and biofiber plastic composites
- Suppliers of equipment and services
- Producers and potential producers
- Consultants and engineers

## CONFERENCE PLANNING COMMITTEE

### CONFERENCE CHAIR

**Craig M. Clemons**, Materials Research Engineer, USDA Forest Products Laboratory

### PROCEEDINGS EDITOR

**Nicole M. Stark**, Chemical Engineer, USDA Forest Products Laboratory

### PLANNING COMMITTEE MEMBERS

**David P. Harper**, Assistant Professor, University of Tennessee; **John C. Hermanson**, Research Engineer, USDA Forest Products Laboratory; **Rebecca E. Ibach**, Research Chemist, USDA Forest Products Laboratory; **Carol Lewis**, Executive Vice President, Forest Products Society; **Kristiina Oksman**, Professor, Luleå University of Technology; **Nicole M. Stark**, Chemical Engineer, USDA Forest Products Laboratory; and **Jerrold E. Winandy**, Project Leader, USDA Forest Products Laboratory

## HOSTS



USDA Forest Service,  
Forest Products  
Laboratory,  
<http://www.fpl.fs.fed.us>



Forest Products Society,  
<http://www.forestprod.org>

## IN COOPERATION WITH



IUFRO Research Group D5.05  
Composites, <http://www.iufro.org/science/divisions/division-5/50000/50500>



Luleå University of Technology,  
<http://www.ltu.se>



University of Tennessee,  
<http://www.utk.edu>



Centre for Biocomposites &  
Biomaterials Processing,  
University of Toronto,

<http://www.forestry.utoronto.ca/bbp/>  
and <http://www.utoronto.ca>

## STUDENT CONTEST SPONSOR



Wood flour supplier **Ontario Sawdust Supplies Ltd.**, is sponsoring the "Jerry Saeman Award of Student Achievement in WPC Research" for the best formal and the best poster presentations.

## INDUSTRY SPONSORS

**Atlas Material Testing Technology LLC** is a recognized leader in weathering testing, offering weathering testing instrumentation as well as laboratory and outdoor testing. Atlas products are designed and manufactured to conform to international, national, and industry standard test methods, including ISO, ASTM, DIN, JIS and numerous others. With a comprehensive network of weathering testing instruments and services, we provide our customers with sophisticated technology and advanced testing solutions to determine how long their products will last. As a result, they can reach their ultimate goals: a quality product, a competitive edge, and a faster time to market.



**CreaFill Fibers** provides specifically engineered cellulose fibers and powders for a wide range of plastics applications. Our products meet the needs of formulators looking for economical non-abrasive fillers that reduce density and polymer loading while adding three dimensional cross-linking reinforcement increasing flex and impact strength. CreaFill's advanced processing technology insures quality control and consistency, resulting in less adjustment to mixing formulas and less variability in our customers finished products.



CreaTech powders and fibers have a 99.6% alpha cellulose content that gives purity and consistency with high temperature tolerance, excellent brightness, low density and great volumetric efficiency. CreaTech adds flexural and impact strength to almost any plastic application.

CreaMix fibers are a cost-effective alternative for plastics applications that require a reliable functional filler at an economical cost and superior performance over traditional particulate fillers. CreaMix fibers are derived post consumer cellulose sources and offer a minimum of 75% cellulose content. Benefits include strong matrix formation, product rigidity, and impact strength. CreaFill Fibers is dedicated to helping make good products better.

## TOTE BAG SPONSOR

**Lyondell Chemical Company** is one of the world's largest chemical companies, with approximately \$18 billion in assets. Our products are the building blocks for countless goods and products that people use every day, such as clothing, food packaging, household furnishings, detergents, cosmetics, automotive parts, construction and home-building materials, paints and coatings, gasoline and many other applications. Lyondell is a major global manufacturer of basic chemicals and derivatives, including ethylene, propylene, propylene oxide, titanium dioxide, styrene, polyethylene and acetyls. It also is a refiner of heavy, high-sulfur crude oil and a significant producer of gasoline-blending components. Equistar Chemicals is a wholly owned subsidiary of Lyondell.



# CONFERENCE PROGRAM

## MONDAY MORNING, MAY 21

7:30 am – 8:30 am - Complimentary Continental Breakfast

### OPENING PLENARY SESSION

8:30 am – 8:45 am

Welcome *Craig M. Clemons* and *Chris Risbrudt*, USDA Forest Products Laboratory

8:45 am – 9:30 am

Market and Product Opportunities for WPCs/NFPCs Beyond Building Industry *Mohini Sain*, University of Toronto

9:30 am – 10:15 am

Applications for WPCs in Europe *Geoff Pritchard*, Hackwell Group

10:15 am – 10:30 am - Coffee Break

10:30 am – 11:15 am

The Quandry of Composite Decking for the Coatings Manufacturer *Victoria Scarborough*, Sherwin Williams Diversified Brands Division

11:15 am – 12:00 noon

Poster Introductions *Jerrold E. Winandy*, USDA Forest Products Laboratory

12:00 noon – 1:25 pm - Luncheon

## MONDAY AFTERNOON, MAY 21

### CONCURRENT SESSIONS

#### SESSION IA: Nanocomposites

1:25 pm – 1:30 pm

Introduction by Session Moderator

1:30 pm – 2:00 pm

Mechanical and Morphological Characterization of Cellulose Fibrils and their Composites *Tanja Zimmermann*, *E. Pöhler*, and *Nico Bordeanu*, Swiss Federal Laboratories for Materials Testing & Research (EMPA)

2:00 pm – 2:30 pm

On the Manufacture and Uses of Nanocellulose *Mikael Ankerfors* and *Tom Lindström*, STFI-Packforsk

2:30 pm – 3:00 pm

Process and Properties of Bio-Nanocomposites Based on Cellulose Whiskers *Aji Mathew* and *Kristiina Oksman*, Luleå University of Technology

3:00 pm – 3:30 pm - Refreshment Break

3:30 pm – 4:00 pm

Optically Transparent Composites Reinforced with Cellulose Nanofibers *Hiroyuki Yano*, *Shin-ichirou Iwamoto*, *Shinsuke Ifuku*, *Antonio Norio Nakagaito*, *Masaya Nogi*, and *Kentaro Abe*, Kyoto University; and *Keishin Handa*, Mitsubishi Chemical Corporation

4:00 pm – 4:30 pm

Reinforcement Capability of Wheat Straw Fibers from Micro to Nano-Size *Ayse Alemdar*, *Mahya Mokhtari*, *Jaymini Kamat*, *Kristiina Oksman*, and *Mohini Sain*, University of Toronto

4:30 pm – 5:00 pm

Temperature Induced Shape Memory Behavior of Nanocellulose Composites *María L. Auad*, Auburn University; *Vasili Contos* and *Steven Nutt*, University of Southern California; and *N.E. Marcovich* and *Mirta I. Aranguren*, INTEMA-Universidad Nacional de Mar del Plata

#### SESSION IB: Processing and Performance

1:25 pm – 1:30 pm

Introduction by Session Moderator

1:30 pm – 2:00 pm

Effect of Nano-Clay on Foaming of Wood Fiber/PP/Clay Composites *Y.H. Lee*, *T. Kuboki*, *Chul B. Park*, and *Mohini Sain*, University of Toronto

2:00 pm – 2:30 pm

Characterization of the Morphological and Mechanical Properties of Foamed WPCs *Neil Granlund*, Phillips Plastics

2:30 pm – 3:00 pm

Injection Molded Solid and Microcellular Polylactide Compounded with Recycled Paper Shopping Bag Fibers *Adam Kramschuster*, University of Wisconsin-Madison; *Shaoqin Gong*, University of Wisconsin-Milwaukee; *Alexander Chandra*, University of Wisconsin-Madison; *Srikanth Pilla*, University of Wisconsin-Milwaukee; and *Lih-Sheng Turng*, University of Wisconsin-Madison

3:00 pm – 3:30 pm - Refreshment Break

3:30 pm – 4:00 pm

Effect of Mixing Conditions During Composite Processing on the Morphology of the Natural Fibers *Carlos J. Quijano-Solis* and *N. Yan*, University of Toronto; and *T. Zhang*, Forintek Canada Corporation

4:00 pm – 4:30 pm

Processing of WPCs – Influence of Temperature and Shear *Christoph Burgstaller* and *W. Stadlbauer*, Transfercenter for Plastics Technology (TCKT) – Upper Austrian Research

4:30 pm – 5:00 pm

Extrusion Rate Influences on the Mechanical and Physical Properties of WPCs *Karl Englund* and *Brent Olson*, Washington State University

5:00 pm – 8:00 pm

Reception with Exhibits and Poster Presentations – A Monday evening reception will feature poster presentations and industrial exhibits by researchers and suppliers of materials, equipment, products, and technical services.

## CONFERENCE HOTLINE

FOREST PRODUCTS SOCIETY

2801 Marshall Court

Madison, WI 53705-2295 USA

Phone: 608-231-1361, ext. 208

Fax: 608-231-2152

E-mail: [conferences@forestprod.org](mailto:conferences@forestprod.org)

<http://www.forestprod.org>

## EARLY BIRD DISCOUNT

REGISTER EARLY AND SAVE!

Attend the conference for only \$625 if you register by May 7,

2007 — save \$75 USD.

Thereafter registration is \$700 USD.

## TUESDAY MORNING, MAY 22

7:30 am – 8:25 am - Complimentary Continental Breakfast

### CONCURRENT SESSIONS

#### SESSION IIA: Materials and Morphology

8:25 am – 8:30 am

Introduction by Session Moderator

8:30 am – 9:00 am

**Flexural Moduli of Vapor-Grown Carbon Nanofiber/Wood Flour/Polypropylene Composites** *Jun Li Shi, Jilei Zhang, Hossein Toghiani, Charles Pittman, and Yibin (Anna) Xue*, Mississippi State University

9:00 am – 9:30 am

**Hybrid HDPE/Wood-Flour/Montmorillonite Nanocomposites** *Omar Faruk and Laurent M. Matuana*, Michigan State University

9:30 am – 10:00 am

**X-ray Microtomography of Fracture Surfaces in Woodfiber-Reinforced Polypropylene** *Mark T. Kortschot and B. Cheng*, University of Toronto

10:00 am – 10:30 am - Coffee Break

10:30 am – 11:00 am

**Electron-Beam Curable Additives for WPCs** *David P. Harper, Timothy G. Rials, and George Dorsey*, University of Tennessee; *William L. Griffith*, Oak Ridge National Laboratory; and *Karl Englund and Michael P. Wolcott*, Washington State University

11:00 am – 11:30 am

**Morphology of Wood Species Affecting Wood-Plastic Interaction: Mechanical Interlocking and Mechanical Properties** *William Gacitua E.* and *Michael P. Wolcott*, Washington State University

11:30 am – 12:00 noon

**Reinforcement of WPC Materials with Bamboo and Abaca Fibers** *A.K. Bledzki and Markus Murr*, Universität Kassel

#### SESSION IIB: Mechanical Performance

8:25 am – 8:30 am

Introduction by Session Moderator

8:30 am – 9:00 am

**Dynamic Mechanical Properties of Extruded Nylon-Wood Composites** *Jianmin Chen and Douglas J. Gardner*, University of Maine

9:00 am – 9:30 am

**Characterizing WPCs via Data-Driven Methodologies** *John G. Michopoulos*, U.S. Naval Research Laboratory; *John C. Hermanson*, USDA Forest Products Laboratory; and *Robert Badaliance*, Montana State University

9:30 am – 10:00 am

**Physical and Mechanical Properties of Novel Layered Composites of Wood Flour and PVC** *Mehdi Tajvidi and Shayesteh Haghdan*, University of Tehran

10:00 am – 10:30 am - Coffee Break

10:30 am – 11:00 am

**Statistical Elastic and Creep Properties of Kenaf Fibers** *Yibin (Anna) Xue, Steve Elder, Devin Shame, and Mark Horstemeyer*, Mississippi State University

11:00 am – 11:30 am

**Fracture Behavior of WPCs** *Li Dagang*, Nanjing Forestry University; *Wu Feng, Wu Zhengyuan, and Ding Jiansheng*, Nanjing JU FENG New Materials Limited Company; and *Xu Xiaojun*, Nanjing Forestry University

11:30 am – 12:00 noon

**Effects of Water Absorption on the Mechanical Properties of HDPE/Wood Composites** *Alireza Kaborani and Alain Cloutier*, Université Laval; and *Michael P. Wolcott*, Washington State University

12:00 noon – 1:25 pm - Luncheon

## EXHIBITS (as of January 1, 2007)

- American Wood Fibers, Schofield, WI, USA, [www.awf.com](http://www.awf.com)
- Atlas Material Testing Technology LLC, Chicago, IL, USA, [www.atlas-mts.com](http://www.atlas-mts.com)
- Brabender Technologie Inc., Mississauga, ON, Canada, [www.brabenderti.com](http://www.brabenderti.com)
- CDS (Custom Downstream Systems Inc.), Lachine, QC, Canada, [www.cdsmachines.com](http://www.cdsmachines.com)
- Colortronic North America, Inc., Flint, MI, USA, [www.colortronicna.com](http://www.colortronicna.com)
- CreaFill Fibers, Chestertown, MD, USA, [www.creafill.com](http://www.creafill.com)
- C.W. Brabender Instruments, Inc., South Hackensack, NJ, USA, [www.cwbrabender.com](http://www.cwbrabender.com)
- ENTEK Extruders, Lebanon, OR, USA, [www.entekextruders.com](http://www.entekextruders.com)
- ESI (Extrusion Services, Inc.), Akron, OH, USA, [www.esi-extrusion.com](http://www.esi-extrusion.com)
- International Specialty Products, Springfield, NJ, USA, [www.ispcorp.com](http://www.ispcorp.com)
- KibbeChem, Inc., Elkhart, IN, USA, [www.kibbechem.com](http://www.kibbechem.com)
- Kice Industries, Inc., Wichita, KS, USA, [www.kice.com](http://www.kice.com)
- Leistritz, Somerville, NJ, USA, [www.leistritz-extrusion.com](http://www.leistritz-extrusion.com)
- Marth Manufacturing Inc., Marathon, WI, USA, [www.marthmanufacturing.com](http://www.marthmanufacturing.com)
- Paratus Industries, Buffalo, NY, USA, [www.paratusindustries.com](http://www.paratusindustries.com)
- Sartomer Company, Inc., Exton, PA, USA, [www.sartomer.com](http://www.sartomer.com)
- Schenck AccuRate, Whitewater, WI, USA, [www accuratefeeder.com](http://www accuratefeeder.com)
- Scott Equipment Company, New Prague, MN, USA, [www.scottequipment.com](http://www.scottequipment.com)
- Strandex Corp., Madison, WI, USA, [www.strandex.com](http://www.strandex.com)
- Struktol Company of America, Stow, OH, USA, [www.struktol.com](http://www.struktol.com)

## PROCEEDINGS OF PRESENTATIONS AT THE CONFERENCES

*A complete proceedings of all presentations given will be prepared following the conference. Attendees will be notified when the proceedings are available and can purchase a copy at cost.*

*Proceedings from the 1st, 3rd, 4th, 5th, 6th, 7th, and 8th International Conferences on Woodfiber-Plastic Composites are still available. To receive an order form and information on these proceedings, please check the box on the enclosed registration form.*

## TUESDAY AFTERNOON, MAY 22

### CONCURRENT SESSIONS

#### SESSION IIIA: Matrix and Biofiber Interaction

1:25 pm – 1:30 pm

Introduction by Session Moderator

1:30 pm – 2:00 pm

**Chemical Functionalization of Lignocellulosic Polymers for the Control of Interfacial Adhesion in Wood and Biofiber-Plastic Composites** *Gilles Sèbe*, Université Bordeaux 1

2:00 pm – 2:30 pm

**The Role of the Interphase in the Mechanical Stability of Adhesive Bonds in Wood** *Wolfgang Gindl*, Johannes Konnerth, Thomas Schoeberl, Juergen Foltrich, Andreas Valla, and Ulrich Mueller, BOKU – University of Natural Resources & Applied Life Sciences

2:30 pm – 3:00 pm

**Probing the Trancrystalline Layer of a WPC with Nanoindentation** *Joseph Jakes* and *John C. Hermanson*, USDA Forest Products Laboratory

3:00 pm – 3:30 pm - Refreshment Break

3:30 pm – 4:00 pm

**Evaluation of WPC Fiber Swell Behaviors Observed by Fluorescent Microscopy** *Armin Thumm* and *Warren Grigsby*, Scion

4:00 pm – 4:30 pm

**Natural Fiber and Polyhydroxyalkanoate Composites: Performance Enhancement** *Scott Anderson*, *Jun Qian*, *Jinwen Zhang*, and *Michael P. Wolcott*, Washington State University

4:30 pm – 5:00 pm

**Nanocomposite-Based Wood Fibers for Reinforcement in Thermoplastic Composites** *Zhiyuan Lin*, *Daniel Hindman*, *Richey M. Davis*, *Yuri Lvov*, and *Scott Rennekar*, Virginia Tech

#### SESSION IIIB: Moisture and Durability

1:25 pm – 1:30 pm

Introduction by Session Moderator

1:30 pm – 2:00 pm

**WPC Durability and the Compelling Case for Field Testing**

*Mark J. Manning* and *Fred Ascherl*, Rio Tinto Minerals (U.S. Borax)

2:00 pm – 2:30 pm

**Effect of Processing Variables on Water Absorption by PP-Based WPCs** *Shu-Kai Yeh* and *Rakesh K. Gupta*, West Virginia University

2:30 pm – 3:00 pm

**The Effect of Pretreatment on the Environmental Durability of Hemp Fiber Reinforced Recycled Low-Density Polyethylene Composites** *Stanley I. Aghedo* and *Caroline Baillie*, Queens University

3:00 pm – 3:30 pm - Refreshment Break

3:30 pm – 4:00 pm

**Chemical Modification of Wood Particles for the Production of WPCs using N-Methylol Compounds and Paraffin** *Anke Schirp*, University of Göttingen and Fraunhofer Institute for Wood Research (Wilhelm-Klauditz-Institute); *Bettina Stoll* and *Carsten Mai*, University of Göttingen; *Eric Richter*, Clariant GmbH; and *Holger Militz*, University of Göttingen

4:00 pm – 4:30 pm

**Moisture Sorption, Micromorphology, and Durability of WPCs made from Modified Wood** *B. Kristoffer Segerholm*, *M.E.P. Wälinder*, *P. Larsson Brelid*, and *M. Westin*, KTH, Royal Institute of Technology

4:30 pm – 5:00 pm

**WPCs with Reduced Moisture: Effects of Chemical Modification on Durability in the Laboratory and Field** *Rebecca E. Ibach*, USDA Forest Products Laboratory

## WEDNESDAY MORNING, MAY 23

7:30 am – 8:25 am - Complimentary Continental Breakfast

#### COMBINED SESSION: Durability and Coatings

8:25 am – 8:30 am

Presentation of Student Contest Awards and Introduction by Session Moderator

8:30 am – 9:00 am

**Effect of Accelerated Aging on the Physical and Mechanical Properties of Wood-Polymer Composites** *Sreekala G. Bajwa*, University of Arkansas; *Alexander S. Anthony*, California Institute of Technology; and *Dilpreet S. Bajwa*, Greenland Composites

9:00 am – 9:30 am

**Surface Characterization of Weathered WPCs Produced from Modified Wood Flour** *James S. Fabiyi* and *Armando G. McDonald*, University of Idaho; and *Nicole M. Stark*, USDA Forest Products Laboratory

9:30 am – 10:00 am

**Radiation Induced Degradation of WPC in the Field and in Laboratory Conditions** *Marek Gnatowski* and *Cecilia Stevens*, Polymer Engineering Company Ltd.

10:00 am – 10:30 am - Coffee Break

10:30 am – 11:00 am

**Coating of Wood-Plastic Composites** *Marie-Pierre G. Laborie* and *Barun S. Gupta*, Washington State University

11:00 am – 11:30 am

**Solid Color Deck Stains: Meeting the New Needs of the Decking Market** *Shelly R. Fox*, Rohm & Haas

11:30 am – 12:00 noon

**Designing a Selectable Performance Colored Capstock Offering Scheme with Regards to Weatherability and Cost** *Christopher E. Richards*, Aspen Research Corporation

12:00 noon – 12:15 pm

Wrap-up Comments by Session Moderator

## POSTER PRESENTATIONS (as of January 1, 2007)

- **VEGETABLE OIL-BASED POLYURETHANE MICRO-FOAMS REINFORCED WITH NATURAL FIBERS** *Norma E. Marcovich*, Universidad Nacional de Mar del Plata and CONICET; *Ilona Racz*, Bay Zoltán Institute for Materials Science & Technology; *Mirta I. Aranguren*, Universidad Nacional de Mar del Plata and CONICET; *Ulises Casado*, Universidad Nacional de Mar del Plata; and *Mirna Mosiewicki*, Universidad Nacional de Mar del Plata and CONICET
- **MODELING WPCs USING NONLINEAR UNIAXIAL DATA** *Nathan J. Bechle*, University of Wisconsin-Madison; and *John C. Hermanson*, USDA Forest Products Laboratory
- **PARTICLEBOARD PRODUCED FROM PLANER SHAVINGS WITH NATURAL-FIBER REINFORCEMENT** *Eyandro Bittencourt*, Santa Catarina State University
- **CHEMICAL TAILORING OF CELLULOSE-NANOFIBRILS AND THEIR APPLICATIONS IN (BIO)COMPOSITE MATERIALS** *Nico Bordeanu*, *Tanja Zimmermann*, and *Klaus Richter*, Swiss Federal Laboratories for Materials Testing & Research (EMPA)
- **A NOVEL METHOD TO ISOLATE MICRO/NANOFIBRIL FROM CELLULOSE FIBER AND ITS REINFORCED PVA NANOCOMPOSITES** *Qingzheng Cheng*, *Siqun Wang*, and *Timothy G. Rials*, University of Tennessee
- **MECHANICAL PROPERTIES OF A SINGLE NATURAL CELLULOSE MICRO/NANOFIBRIL** *Qingzheng Cheng* and *Siqun Wang*, University of Tennessee
- **FLOW PROPERTIES AND DURABILITY ASSESSMENT IN WPCs** *Carlos A. Correa* and *A.S. Camargo*, Universidade São Francisco; and *C.A. Razzino* and *E. Hage Jr.*, Universidade Federal de São Carlos
- **PROPERTIES OF WPCs AFTER ACCELERATE AGING TREATMENT** *Li Dagang*, Nanjing Forestry University; *Ding Jiansheng*, *Wu Feng*, and *Wu Zhengyuan*, Nanjing JU FENG New Materials Limited Company; and *Hu Feifei*, Nanjing Forestry University
- **STUDY ON THE DURABILITY OF WPCs** *Li Dagang*, Nanjing Forestry University; *Wu Zhengyuan*, *Wu Feng*, and *Din Jiangshen*, Nanjing JU FENG New Materials Limited Company; and *Shun Zhangyin*, Nanjing Forestry University
- **WATER ABSORPTION PERFORMANCES IN WPC MATERIALS** *Alex Dragomirescu* and *Jim Nash*, Wellington Polymer Technology Inc.
- **APPLICATION OF MEDIATORS IN ENZYMATICAL ACTIVATION OF FIBERSELF COHESIONS FOR THE PRODUCTION OF ENZYME-BONDED, BINDER-FREE DERIVED TIMBER PRODUCTS** *Markus Euring* and *Dr. Kharazipour*, Georg-August University of Goettingen
- **ISOLATION OF CELLULOSE MICROFIBRILS FROM MUSACEAS AGRICULTURAL RESIDUES** *Piedad Gañán*, *Robin Zuluaga*, and *Javier Cruz*, Pontificia Bolivariana University; and *Aloña Retegi* and *Inaki Mondragon*, University of the Basque Country
- **POLY(E-CAPROLATONE) GRAFTED ON CELLULOSE MICROFIBRILS** *Piedad Gañán*, Pontificia Bolivariana University; and *Asisi Samir*, *Hanna Lönnberg*, and *Lars Berglund*, KTH, Royal Institute of Technology
- **CHARACTERIZING THE MECHANISM OF IMPROVED ADHESION ON MODIFIED WPC SURFACES** *G. Oporto*, *W. Gramlich*, *D. Neivandt*, and *Douglas J. Gardner*, University of Maine
- **MANUFACTURE OF EXTRUDED WOOD-NYLON COMPOSITES: PROCESSING AND PROPERTIES** *Douglas J. Gardner*, University of Maine; *Shane R. O'Neill*, LDI Composites R&D; and *Stephen M. Shaler*, University of Maine
- **PRODUCTION OF POLYETHYLENE (HDPE) COMPOSITES REINFORCED WITH FURNITURE INDUSTRY WOOD AND WOOD COMPOSITES RESIDUES** *Everton Hillig*, Universidade de Caxias do Sul; *Setsuo Iwakiri*, Universidade Federal do Paraná; *Mara Zeni*, Universidade de Caxias do Sul; and *Clovis Roberto Haselein*, Universidade Federal de Santa Maria
- **CHALKING AND SURFACE DETERIORATION OF WOODFIBER-PLASTIC COMPOSITES BY WEATHERING TRIALS** *Makoto Kiguchi*, *Yutaka Kataoka*, *Hiroshi Matsunaga*, *Ikuo Momohara*, and *Koichi Yamamoto*, Forestry & Forest Products Research Institute; and *Philip D. Evans*, University of British Columbia
- **MECHANICAL AND THERMAL PROPERTIES OF THE THERMOPLASTICS REINFORCED WITH NATURAL FIBERS PROCESSED BY ELECTRON BEAM** *Sok Won Kim*, University of Ulsan; and *Seungmin Oh* and *Kyusee Lee*, Ilkwang Co., Ltd.
- **PROCESSING AND MECHANICAL PROPERTIES OF HIGHLY FILLED CELLULOSE FIBERS POLYPROPYLENE COMPOSITES** *Marie Le Baillif*, *Magnus Bengtsson*, and *Kristiina Oksman*, Norwegian University of Science & Technology
- **EFFECTS OF PROCESS VARIABLES IN THE STEAM EXPLOSION PROCESS ON THE MECHANICAL PROPERTIES OF THERMOPLASTIC COMPOSITES** *Jong Nam Lee*, Virginia Tech
- **HIGHLY DETERIORATED BEETLE-KILLED SPRUCE FROM THE KENAI PENINSULA, ALASKA, AS RAW MATERIAL SOURCE IN WPCs** *Eini C. Lowell*, USDA Forest Service; *Vikram Yadama*, Washington State University; and *David L. Nicholls*, USDA Forest Service
- **PLASTICIZATION OF WOOD FIBER BY BENZYLATION** *Lina Ma* and *Armando G. McDonald*, University of Idaho
- **NANO-AL<sub>2</sub>O<sub>3</sub> WHISKERS AS AN ADDITIVE FOR AMINO RESIN-BASED WOOD ADHESIVES – EFFECT ON THE PERFORMANCE OF THE WOOD-WOOD JOINTS** *Mariusz Mamiński*, *Piotr Borysiuk*, and *Jerzy Pawlicki*, Warsaw Agricultural University
- **FLOORING SUBSTRATE FROM RECYCLED POLYURETHANE FOAM** *Doug Moore*, Eurosource Ltd.
- **INVESTIGATION OF PROCESSING-STRUCTURE RELATIONSHIP OF WOOD-PLASTIC COMPOSITE FOAMS BY USING DESIGN OF EXPERIMENTS** *Gangjian Guo*, University of Toronto; *Ghaus M. Rizvi*, University of Ontario Institute of Technology; and *Chul B. Park*, University of Toronto
- **MECHANICAL PROPERTIES OF CELLULOSE FIBER-REINFORCED HIGH-DENSITY POLYETHYLENE COMPOSITES** *Takashi Kuboki*, *Y.H. Lee*, *Chul B. Park*, and *Mohini Sain*, University of Toronto
- **STUDIES OF HDPE/NEEM BARK FLOUR BIO-COMPOSITE** *Kamini Sewda* and *S.N. Maiti*, Indian Institute of Technology
- **UNIDIRECTIONAL NATURAL FIBER-POLYOLEFIN LAMINATES: THERMAL AND MECHANICAL PROPERTIES** *Sangyeob Lee*, *Sheldon Q. Shi*, and *Yibin Xue*, Mississippi State University
- **FIRE RETARDANCY AND MECHANICAL PROPERTIES OF FIRE-RETARDANT WOOD-FIBER HIGH-DENSITY POLYETHYLENE COMPOSITES** *Yongming Song*, *Qingwen Wang*, and *Shujuan Sui*, Northeast Forestry University
- **THE PROPERTIES OF BAMBOO FLOUR-PLASTIC COMPOSITES WITH A HIGH FILLER CONTENT** *Masahiro Takatani*, *Ayako Ishikawa*, *Takashi Sakamoto*, *Kohei Ikeda*, and *Tadashi Okamoto*, Kin-ki Daigaku University
- **MECHANICAL AND THERMAL PROPERTIES OF AGAVE AMERICANA REINFORCED HDPE** *Thimothy Thamae* and *Caroline Baillie*, Queens University
- **DEVELOPMENT OF A WOOD FIBER PANEL PRODUCT CONTAINING POLYPROPYLENE/POLYESTER BICOMPONENT FIBER** *Herman van Dyk* and *Perry Peralta*, North Carolina State University
- **A UNIQUE FUNGICIDE FOR WOOD-FILLED PLASTIC** *William B. Woods*, International Specialty Products
- **A MOISTURE DIFFUSION MODEL FOR NATURAL FIBER-REINFORCED COMPOSITES** *Yibin (Anna) Xue* and *Kunpeng Wang*, Mississippi State University; *Hongwu Zhang*, Dalian University of Technology; and *Mark Horstemeyer*, Mississippi State University
- **FLEXURAL FATIGUE PROPERTIES AND CUMULATIVE DAMAGE MODEL VERIFICATION OF WOOD FLOUR-POLYPROPYLENE COMPOSITES** *Han-Seung Yang* and *Michael P. Wolcott*, Washington State University
- **EXTRUSION AND COMPRESSION MOLDING OF WOOD/POLYLACTIC ACID COMPOSITE WITH HIGH FILLER CONTENT** *Kohei Ikeda*, *Masahiro Takatani*, *Kei Sakamoto*, and *Tadashi Okamoto*, Kinki-Daigaku University
- **HIGH-PERFORMANCE COMPOSITES MADE FROM CELLULOSE NANOFIBERS** *Patrick Qua* and *Peter Hornsby*, Queens University
- **A SIX SIGMA APPROACH TO SCALE-UP AND TRANSFERRING OF WOOD-FIBER COMPOSITE PROCESSES** *Keith Effertz* and *Scott Koenig*, Aspen Research Corporation
- **UNDERSTANDING PROCESS AND MATERIAL INTERACTION OF A FOAMED WOOD-FIBER COMPOSITE** *Keith Effertz*, Aspen Research Corporation
- **USING A SYSTEMATIC APPROACH TO CONVERTING BATCH TO CONTINUOUS PROCESSING** *Keith Effertz*, Aspen Research Corporation



## CONFERENCE INFORMATION

### DATE AND LOCATION

May 21-23, 2007

Monona Terrace Community and Convention Center  
Madison, Wisconsin, USA • <http://www.mononaterrace.com>

Inspired by Wisconsin native Frank Lloyd Wright at the peak of his creative powers, and opened to the public in 1997, the Monona Terrace Community and Convention Center is one of the country's premier conference and convention facilities. The Monona Terrace is an architecturally striking 250,000 square foot structure that combines spectacular glass vistas of Lake Monona with top quality meeting and exhibition space. The Monona Terrace is connected to the Hilton Madison Monona Terrace Hotel via an enclosed, climate-controlled skywalk.

### REGISTRATION FEE

The regular attendee fee is \$625 USD per person, and includes conference materials, all sessions, three continental breakfasts, two luncheons, one reception, and five coffee/refreshment breaks.

### STUDENT REGISTRATION FEE (full-time student; ID required)

The student fee is \$125 USD per person, and includes conference materials, all sessions, three continental breakfasts, two luncheons, one reception, and five coffee/refreshment breaks.

To register for the conference, please complete the enclosed registration form and mail it to the Forest Products Society, or you may register by fax at 608-231-2152, or by phone at 608-231-1361, ext. 208. The conference registration desk on-site will be located on Level Four of the Monona Terrace Community and Convention Center. Registration desk hours will be: Sunday, May 20, 3:00-7:00 pm; Monday, May 21, 7:00 am-5:00 pm; Tuesday, May 22, 7:00 am-5:00 pm; and Wednesday, May 23, 7:00 am-12:00 noon.

### EARLY BIRD DISCOUNT

Register by May 7, 2007 and save \$75 USD. Thereafter the cost is \$700 USD.

### GROUP RATES

For companies wishing to register four or more attendees, group discounts are available. Please contact the Forest Products Society for more details at 608-231-1361, ext. 208 or [conferences@forestprod.org](mailto:conferences@forestprod.org).

### CANCELLATIONS

Full refunds for cancellations will be given if requested by mail, e-mail, phone, or fax by May 7, 2007. A charge of 15% of the registration fee will be incurred if the cancellation is made between May 8-14. NO REFUNDS will be given after May 14. Attendees may be substituted at any time at no charge.

### RECEPTION

A Monday evening, May 21 reception will feature poster presentations and industrial exhibits by researchers and suppliers of materials, equipment, products, and technical services.

### SPONSORSHIP OPPORTUNITIES

Sponsorship opportunities are available for special recognition during the conference. Conference literature will include sponsor logos. Various levels of sponsorship are available. Please contact the Forest Products Society for more details at 608-231-1361, ext. 208 or [conferences@forestprod.org](mailto:conferences@forestprod.org).

### STUDENT CONTEST

As in our 2005 conference, the "Jerry Saeman Award of Student Achievement in WPC Research" will be given for the best formal and the best poster presentations.

### OPTIONAL TOUR

An optional tour of the USDA Forest Products Laboratory will take place on Wednesday afternoon, following the conference wrap-up. The tour will include a traditional Wisconsin tailgate lunch including brats (meat and veggie), potato salad, baked beans, sauerkraut, and drinks. If you would like to sign-up for the tour, please check the box on the enclosed registration form.

### SUPPLIERS' SHOWCASE

Exhibit spaces are still available. The cost is \$595 USD (exhibit space only) or \$895 USD (exhibit space + one regular registration). Exhibitors may either use tables provided by Valley Expo, or bring their own stand or display. The Suppliers' Showcase will take place on Monday evening, May 21, during an informal reception. The Suppliers' Showcase will feature industrial exhibits by researchers and suppliers of materials, equipment, products, and technical services. Attendees will enjoy complimentary hors d'oeuvres and a cash bar while circulating among the exhibits. If you would like to reserve exhibit space, please fill out and return the enclosed registration form.

### LITERATURE DISPLAY

If your company is not sending an attendee, but you still wish to promote your company at the conference, we will display your company literature at the conference for a fee of \$300 USD. If you would like to reserve a literature display, please fill out and return the enclosed registration form.

### TECHNICAL FORUM (POSTER SESSION)

Technical Forum (poster) presentation spaces are still available. The Technical Forum (poster session) will take place on Monday evening, May 21, during an informal reception. The Technical Forum will consist of poster presentations by individuals who are stationed at a booth space similar to a typical exhibit booth. Each space contains a draped table and a 3.5- by 8-foot posterboard on which an abstract, key points, conclusions, charts, and diagrams are posted. If you believe you have technical materials suitable for a poster presentation (no commercial materials accepted), please contact the Forest Products Society at 608-231-1361, ext. 208 or [conferences@forestprod.org](mailto:conferences@forestprod.org). You may also submit your request for a poster presentation on-line at <http://www.forestprod.org/woodfiber07poster.html>. *Technical Forum (poster) presentations will be accepted based upon a review of their suitability to the objectives of the conference and on the availability of space.*

### HOTEL ACCOMMODATIONS

The host hotel for the conference is the Hilton Madison Monona Terrace. Set on the shimmering shores of Lake Monona in the heart of downtown Madison, Wisconsin, the Hilton Madison boasts spectacular views of the city and surrounding lakes, and is conveniently located one block from the State Capitol and minutes from the University of Wisconsin. Guests can enjoy the lively atmosphere of the adjacent Monona Terrace Community and Convention Center, with its rooftop concerts and lakeside cultural events and art exhibits, or a host of area attractions. Located in a sophisticated city that remains close to its heartland roots, the Hilton Madison offers professional service and warm hospitality to all.

A block of rooms has been reserved at the Hilton Madison at a special group rate of \$149 USD + tax for standard single/double occupancy. The room block will be held through April 20, 2007. After April 20, remaining rooms in the block will be released for sale to the general public, and attendees cannot be guaranteed the group rate or room availability after this date. A deposit of first night's room revenue + tax is required with all reservation requests. The deposit will be forfeited for all no-shows and for all reservations cancelled within 48 hours prior to arrival. In order to receive the group rate, be sure to state that you are with Group Code: FPS. Phone reservations to 1-800-Hiltons (toll-free) or 608-255-5100. Or you may book your reservation on-line at [http://www.hilton.com/en/hi/groups/personalized/msnmhhf\\_fps/index.jhtml](http://www.hilton.com/en/hi/groups/personalized/msnmhhf_fps/index.jhtml).

## CONFERENCE REGISTRATION FORM

9th International Conference on Wood &  
Biofiber Plastic Composites

Monona Terrace Community and Convention Center  
Madison, Wisconsin, USA **MAY 21-23, 2007**

Mail to: Forest Products Society  
2801 Marshall Court  
Madison, WI 53705-2295 USA  
Phone: 608-231-1361, ext. 208 Fax: 608-231-2152  
E-mail: [conferences@forestprod.org](mailto:conferences@forestprod.org) <http://www.forestprod.org>



Mr. \_\_\_\_\_ Preferred first name for badge \_\_\_\_\_  
 Mrs. \_\_\_\_\_  
 Ms. First Name \_\_\_\_\_ Last Name (Surname) \_\_\_\_\_  
 Dr. \_\_\_\_\_

Job Title \_\_\_\_\_

Company/Organization \_\_\_\_\_

Mailing Address:  Home  Business Street/P.O. \_\_\_\_\_

City \_\_\_\_\_ State or Province/Country \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_ E-mail \_\_\_\_\_

### REGISTRATION FEES (please check box and write amount)

**Register early and save! Through May 7<sup>th</sup>**

- Regular attendee fee @ \$625 USD (through May 7<sup>th</sup>) \_\_\_\_\_  
 Late attendee fee @ \$700 USD (after May 7<sup>th</sup>) \_\_\_\_\_  
 Student fee @ \$125 USD (full-time student; ID Required) \_\_\_\_\_  
 Exhibit space only @ \$595 USD \_\_\_\_\_  
 Exhibit space + one regular registration @ \$895 USD \_\_\_\_\_  
 Literature display @ \$300 USD \_\_\_\_\_

**TOTAL** \_\_\_\_\_

### IMPORTANT!

Please indicate which concurrent sessions you will be more likely to attend:

- Session IA  Session IB (Monday afternoon)  
 Session IIA  Session IIB (Tuesday morning)  
 Session IIIA  Session IIIB (Tuesday afternoon)

*An optional tour of the USDA Forest Products Laboratory  
will take place on Wednesday afternoon.*

- Please sign me up for the tour (no charge)  
 Please send me information/order form for the proceedings of the 1st, 3rd, 4th,  
5th, 6th, 7th, and 8th International Conferences on Woodfiber-Plastic Composites

- MY EMPLOYMENT AREA IS:**  Materials Supplier  
 Equipment Manufacturer  Product Manufacturer  
 Architect  Association  Consulting/Technical  
 Education/Consulting  Education/Extension  
 Engineer  Government  Publisher  Research  
 Retired  Student  Supplier  Other

### METHOD OF PAYMENT

Payment in U.S. funds or purchase order must accompany registration form. Make checks payable to the Forest Products Society. You may order through your VISA, MasterCard, Discover, or American Express by supplying the information requested below.

Please bill me by:  VISA  MasterCard  
 Discover  American Express

Card No. \_\_\_\_\_

Security Code \_\_\_\_\_ Expiration Date \_\_\_\_\_

Cardholder's Name \_\_\_\_\_

### SPECIAL NEEDS

If you have any special needs, such as a special diet, or needs related to sight, hearing, or physical mobility, please give a brief description of these needs below. Early notification will enable us to more efficiently accommodate your needs. Special Needs: \_\_\_\_\_

## HOTEL RESERVATION FORM

**Group:** FPS

**Room Block:** May 20-23, 2007



*(Do not mail to the Forest Products Society)*

**Mail to:** Hilton Madison Monona Terrace

Attn: Reservations Department

9 East Wilson Street

Madison, WI 53703 USA

**Phone:** 1-800-Hiltons (toll-free) or 608-255-5100

**Reservation Fax:** 608-251-4550 <http://www.hiltonmadison.com>

A block of rooms has been reserved at the Hilton Madison at a special group rate of \$149 USD + tax for standard single/double occupancy. The room block will be held through April 20, 2007. After April 20, remaining rooms in the block will be released for sale to the general public, and attendees cannot be guaranteed the group rate or room availability after this date. A deposit of first night's room revenue + tax is required with all reservation requests. The deposit will be forfeited for all no-shows and for all reservations canceled within 48 hours prior to arrival. In order to receive the group rate, be sure to state that you are with Group Code: FPS.

Arrival Date: \_\_\_\_\_ Departure Date: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_ Phone: \_\_\_\_\_

No. of Adults: \_\_\_\_\_ Room Type:  Single (1 King bed)  Double (2 Double beds)  Smoking  Non-smoking

*A deposit of first night's room revenue plus tax is required for all reservations when reservations are made.*

Please check one of the following:

Please find my check enclosed. Amount enclosed: \$ \_\_\_\_\_  VISA  MasterCard  American Express  Discover

Card No. & Security Code \_\_\_\_\_

Expiration Date \_\_\_\_\_

Cardholder's Name \_\_\_\_\_