The 2nd
Advanced Wood Adhesion Short Course
A Wood-Based Composites Center
Advanced Content Short Course

November 2-3, 2011

Location: Skelton Conference Center
On the campus of Virginia Tech
Blacksburg, VA

What you will learn:
This course will touch upon a variety of advanced subjects related to wood science and wood adhesion. Some topics will be geared towards wood-based composites such as oriented strand board, particleboard and plywood. Other topics will provide broader perspectives appropriate for the bonding and testing of solid wood assemblies, or of assemblies bonded from composite materials. Details are outlined below. The instructors are senior faculty, internationally recognized for expertise in their fields. The course content is advanced with respect to “Wood Adhesion,” the WBC’s annual introductory adhesion course; nevertheless, the material will be presented at a fundamental level, allowing you to apply this knowledge for your purposes. The format consists of in-depth lecture and lively group discussion. A limited number of participants will be invited to send in wood-adhesion samples prior to the course, for which resin penetration imaging will be conducted. These images will be incorporated into class lecture and discussion, giving students an opportunity to study real-life examples of wood adhesion.

There are no prerequisites for the course. It is highly recommended, however, that participants have a fundamental understanding of wood structure and properties, college-level chemistry, and a basic understanding of stress and strain relationships fundamental to engineering mechanics.

Participants wishing to brush up on their wood material science or wood adhesion knowledge should consider completing a course in Oregon State’s online Wood-Based Composites Short Course Series. Self-paced courses are available for both wood structure (Module 1) and basic wood adhesion (Module 4), and would provide solid background in preparation for Advanced Wood Adhesion. Contact the WBC Center or visit the Oregon State Ecampus website for more information at http://ecampus.oregonstate.edu/workforce/wood-based-composite-science/.
Who Should Attend:
- Persons involved with the research and development of wood adhesive and wood composite technologies.
- Individuals who manage adhesive or composite-manufacturing processes, and who wish to increase their knowledge of wood adhesion.
- Adhesive suppliers seeking an advanced understanding of wood adhesion and the science supporting it.
- Persons who have attended a WBC Center “Wood Adhesion” short course, and are seeking the next level of knowledge.

Agenda:
DAY ONE:
8:00 a.m. Registration, coffee
8:10 am Introduction, Opening remarks
8:15 a.m. Participant Introductions and Questionnaire
8:30 a.m. Wood Polymer Science: Structure, Order & Chemical Interactions (Frazier)
  - Basic chemical structure of wood polymers
  - Organization of wood polymers
  - Wood rheology
  - Wood swelling in aqueous and organic liquids
9:30 a.m. Thermoset Cure Measurement and Modeling (Kamke)
  - Dielectric methods
  - Dynamic mechanical analysis
  - Calorimetry
  - Kinetic equations
10:30 a.m. Break
10:45 a.m. Stresses in Adhesive Bonds (Dillard)
  - Shear lag model and applications
  - Beam on elastic foundation model and applications
  - Stresses in lap, butt, and cleavage joints
11:45 a.m. Group Discussion (All)
12:15 p.m. Lunch
1:15 p.m. Wood Surface Chemistry: Wetting & Penetration (Frazier)
- Surface energy, viscosity and adhesive penetration
- The Laplace equation
- The Lucas-Washburn Equation

2:15 p.m. Bond Performance vs. Penetration (Kamke)
- Strain distribution in vicinity of bond interface
- Resistance to moisture
- Failure modes

3:00 p.m. Break

3:30 p.m. Introduction to Fracture Mechanics (Dillard)
- Stress intensity factor
- Strain energy release rate
- Fracture applications to understanding joint failure

4:30 p.m. Group Discussion (All)

5:15 p.m. Adjourn

6:30 p.m. Optional Group Dinner (not hosted)

DAY TWO:
8:00 a.m. Conducting Mechanical Tests for Adhesion (Dillard)
- Constitutive tests
- Strength tests
- Fracture tests

9:00 a.m. Resin Penetration Measurement (Kamke)
- Optical methods
- Electron microscopy
- X-ray tomography
- Images of participant samples

10:00 a.m. Break

10:15 a.m. A Review of the HMR Coupling Agent (Frazier)
- Coupling agents for wood bonding
- Hydroxymethylated resorcinol, HMR

11:15 a.m. Group Discussion (All)
12:00 p.m. Lunch

1:00 p.m. Surface Inactivation (Kamke)
- Theories of surface inactivation
- Measurement methods
- Implication of adhesive bonding

2:00 p.m. Adhesive Bond Durability (Dillard)
- Viscoelasticity
- Environmental effects
- Accelerated characterization

3:00 p.m. Break

3:15 p.m. Group Discussion (All)

4:30 p.m. Course Evaluations and Wrap-Up, Adjourn

About the Instructors:
David Dillard is the Adhesive and Sealant Science Professor of the Engineering Science and Mechanics Department at Virginia Tech. He specializes in test methods, fracture mechanics, time-dependence, and durability of adhesive bonds and other polymeric materials.

Chip Frazier is the T.M. Brooks Professor of Wood Science and Forest Products at Virginia Tech and he is the Director of the Wood-Based Composites Center. He specializes in wood adhesion and wood rheology.

Fred Kamke is Professor and JELD-WEN Chair of Wood-based Composites Science in the Department of Wood Science and Engineering at Oregon State University. He specializes in composite manufacture, resin penetration and distribution, and wood and water relationships.

Cost:
The cost for the two-day short course is $1095.00 per person. Members of the Wood-Based Composites Center are eligible for a reduced cost of $825.00 per person. Registration fee includes workshop materials as well as lunch and refreshments during the class.
Lodging:
You are responsible for making your own lodging reservations. A block of room has been reserved at the Inn at Virginia Tech, 901 Prices Fork Road, Blacksburg, for a special room rate of $119.00 per night, single or double occupancy. Reservations can be made online or by calling (877) 200-3360 or (540) 231-8000. Be sure to mention that you are participating in the “Advanced Wood Adhesion Short Course” to receive the reduced rate. Rooms will be released to the public on October 10th, and since rooms are not guaranteed to be available after this date, reservations should be made early.

You can download directions to the hotel here.

For More Information:
Contact Linda Caudill, Managing Director, Wood-Based Composites Center at (540) 231-7092 or by E-mail at lcaudill@vt.edu.

To Register:
You can register online through our website at http://www.wbc.vt.edu, or contact the Virginia Tech Department of Continuing and Professional Education Conference Registrar
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