

WBC NEW PROJECT PROPOSAL

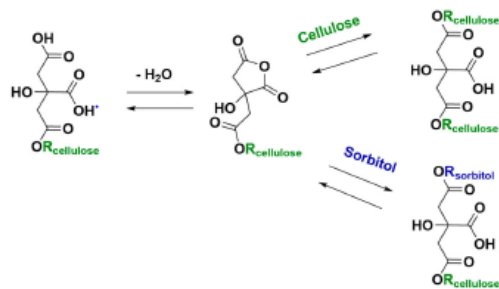
Project Title:	Preliminary investigation of the potential for sorbitol-citrate modification to function in North American wood species and improve strandboard and plywood durability and dimensional stability				
Expected Duration:	1 Year	Start Date:	9/25/2024	Site:	OSU
Investigator(s):	Gerald Presley, Laurence Schimleck, John Simonsen, and Islam Hafez			Submitted by:	Gerald Presley
Related to Topic/Theme:	TOPIC 2024-09-RD, TOPIC-2024-19				

GOALS & OBJECTIVES: The sorbitol-citrate (Sor-CA) method for wood modification utilizes bio-derived compounds to improve wood durability and dimensional stability. The primary goal of this research is to assess the feasibility of incorporating the Sor-CA method into wood composites. This goal will be accomplished by completing the following objectives:

- 1) Measure the impact of Sor-CA treatment on wood surface energy and the kinetics of adhesive cure
- 2) Measure the treatability of aspen strands (AS) and Douglas-fir (DF) veneer using the Sor-CA method
- 3) Measure the impact of Sor-CA treatment on aspen strandboard and Douglas-fir plywood performance

EXPERIMENTAL PLAN:

Sor-CA treatability: Douglas-fir veneers (16 x 16-inch) or aspen strands will be vacuum impregnated with a solution of sorbitol and citric acid at a molar ratio of 1:3. Treated materials will be dried and then treated at 140°C for 24 hrs to cure. Weight gains of 10, 25, and 40% will be targeted. A subsample of each batch will be tested for leachability to determine the actual esterified weight gain for each batch.



Resin cure kinetics: 0.6 mm thick maple veneers will be treated as above to 10, 25, and 40% and leached prior to analysis. Two veneers will be glued together using MDI or PF resins and analyzed using dynamic mechanical analysis (DMA) using a heat ramp to facilitate cure. Impact of treatment on shear modulus development and crosslink density will be determined.



Surface properties: Treated DF veneers or AS will be analyzed for surface energy using a contact angle analyzer. MDI or PF resins will be applied to surfaces and contact angle will be measured for each resin.



Sor-CA panel performance: Six 16 x 16-inch test panels will be made with each Sor-CA retention (10, 25, 40%) for strandboard and plywood panels. Strandboard panels will be made using 6% MDI resin in the furnish and plywood panels will be made using PF resin. Panels will be tested for internal bond strength and thickness swell by ASTM 1037.

OUTCOMES & DELIVERABLES:

TASK	DELIVERABLE	MONTH/YEAR	RESPONSIBILITY
Resin Cure Kinetics	Sor-CA impact on cure	03/2025	Shane Johnson
Contact Angle Analysis	Wettability/surface energy	03/2025	Shane Johnson
Sor-CA Treatability	Weight gain/leachability	12/2024	Shane Johnson
Panel Characterization	IB, thickness swell	08/2025	Shane Johnson

EXPECTED PRACTICAL IMPLICATIONS / IMPACTS: This study will determine whether Sor-CA treatment is a viable option for improving composite durability using N. American wood species. It will generate some understanding of the mechanisms of interaction between common adhesives and Sor-CA modified wood.

BUDGET JUSTIFICATION:

Three terms of salary and tuition support for Shane Johnson
Supplies including chemicals for treatments.

BUDGET: Year 1 Budget Estimate:

Student GRA and benefits: \$30,401; Tuition and Fees: \$16,260
Materials/Supplies: \$2,500 **Total Yr. 1: \$49,151**

