

Alternative Treatments for Soft Woods and Fiber Products to Increase Potential Uses, Health Safety and Environmental Responsibility

Team Composition and Roles

Entrepreneurial Lead: *John Schutte* is a PhD student in Chemical Engineering at New Mexico State University. Prior to returning to graduate school, Mr. Schutte worked for 10 years as a plant engineer and project manager in a variety of biomass-based products, chemical, and materials manufacturing companies. His research focuses on value-added products from local woody biomass and agricultural residues, and process modeling.

Principal Investigator: *Dr. Catherine Brewer* is an Assistant Professor of Chemical Engineering at NMSU. She operates a biomass thermochemical processing research group that conducts research in the use of local residual biomass to meet material, water and energy needs through chemical treatment, pyrolysis, torrefaction, and hydrothermal liquefaction.

Mentor: *Robert Green* is the originator of this chemistry. He collaborated with Los Alamos National Laboratory to demonstrate the mechanism of the chemical reaction. He filed a patent application for the use of this chemistry in drying, stabilizing and hardening soft wood for fine machining in volume production. Bob intends to manufacture wood products using local, soft wood.

Co-Mentor: *Zetdi Sloan* is the Director of the Arrowhead Technology Incubator, accelerating the growth of scalable water, energy, and agriculture startups. Mrs. Sloan oversees NM FAST, the state's resource center for SBIR/STTR proposal development. She attended Steve Blank's first Lean LaunchPad® for Incubators and Accelerators Seminar in 2013, and applied the methodology to the incubator. Zetdi successfully founded her own startup, Zetaac, LLC, in 2014.

Relevant NIFA Awards

The team is claiming USDA NIFA funding lineage through Dr. Brewer's current National Needs Fellowship grant:

| Award # | Award Title | PIs | Amount | Dates | Program Officer |
|------------------|---|--|-----------|-----------------|-----------------|
| 2015-38420-23706 | Sustainable Use of Biomass Resources in a Semi-Arid Landscape: Connecting Chemical Engineering, Soil Science, and Extension | PI: Catherine Brewer Co-PIs: April Ulery, O. John Idowu, David Rockstraw, Ram Acharya | \$241,000 | 7/15/15-7/14/20 | Ray Ali |

Potential Commercial Impact

Reactive silicon-based chemistry can deliver and molecularly bond a silicon derivative to porous substances, including soft woods. Advances in low-VOC, sustainably-derived, bio-based solvents, used to improve penetration, eliminate the use of petrochemicals and minimize generation of greenhouse gases. There are also promising developments in sustainable and less toxic biocides and flame retardants. An early-stage base chemistry has been demonstrated to dry,

harden, and stabilize soft wood without kiln drying. The base chemistry can also deliver and molecularly bond beneficial amendments, such as water repellents, biocides, flame retardants, UV degradation inhibitors and colorants; this delivery mechanism thoroughly infuses the wood and minimizes losses due to leaching and other wear. The implication is that both dimensional lumber and preserved lumber can be produced at lower cost, with improved yield and service life, and reduced environmental impact. There are also implications in siding and shingles, manufactured wood products, drywall, and insulation. This chemistry also provides a potential solution to the current problem of unhealthy flame retardants in textiles and upholstery foams. Anticipated reduction of VOC gases can impact the coatings industry as well. Estimated annual global production of sawnwood is 400 million cubic meters. The wood preservative, green building materials, textile chemicals and coatings markets are valued at a combined, projected \$387 billion.

Current Commercialization Plan

Grant-supported research into broadly applicable base chemistry and minimization of VOC gases will result in patented chemical formulas. The team seeks a market research opportunity to confer with prospective corporate buyers and/or collaborators to assess market acceptance and value. This market research will help us to make an eventual decision between sale of the anticipated patented base chemical formulas or creation of a new company to pursue further small business research grants to develop patented products, including application-specific, environmentally-responsible amendments.