

Adventures of a Disruptive Green Chemistry Technology: PureBond® Plywood

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Panelists

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The US Green Building Council's LEED rating system is a benchmarking eco-label that uses market based-information to accelerate sustainability in the building industry. The program addresses issues such as energy, water, nonrenewable resources, social justice, and community quality of life. Ultimately, it is about making buildings that are more healthy and humane.

Material resources and indoor air quality are the LEED issues most relevant for green chemistry. Disclosure of technical product information, including ingredients, is a key element of the system. The program has aspirational goals such as buildings that produce more water and energy than they use but it also works with market players to be realistic about what can be accomplished. It is therefore a step-wise evolution toward a better paradigm for buildings and materials. The LEED program is moving away from single selection criteria to more holistic evaluation of multiple criteria

Inspired by the ability of mussels to adhere strongly to surfaces in the ocean, Dr. Li created an adhesive for wood products that does not contain formaldehyde or other toxic chemicals. Traditional adhesive companies were not interested in the product because they viewed formaldehyde adhesives as their core business. However, Columbia Forest Products had been searching for a non-formaldehyde alternative and helped fund the scaling up of production. After the adhesive was commercialized, donors to Oregon State who are from formaldehyde-using companies began pressuring the university to be sensitive to their needs and to not talk about the hazards of formaldehyde.

Dr. Li has developed two other products. One is a pressure-sensitive adhesive tape made from vegetable oil. The other is a styrene-free polyester resin that is used to make a fiber-reinforced composite material. The composite can be used in airplanes and wind turbines. Given the pressures brought against him for promoting a safer alternative to formaldehyde, he is hesitant about being the target of similar pressures from the styrene industry.

Columbia Forest Products is a diversified company with long experience as an early adopter of innovations. When formaldehyde was classified as a probable or known carcinogen, the writing was on the wall. The company introduced PureBond® with a marketing campaign focused on the dangers of formaldehyde. This led to a cascade of opposition from industry and customers that was swift and lasted for years. After Hurricane Katrina, it became well known that the formaldehyde in FEMA trailers made the occupants sick. The debacle increased demand for safer alternatives and for tighter regulations.

Opportunities for Safer Chemicals and Products

- By conferring points for greener materials and products, the LEED rating system creates market opportunities for safer products.
- As an employee-owned company, Columbia Forest Products has the ability to follow long-term strategies.
- The plywood industry is under attack from cheap imports that use urea formaldehyde. Non-formaldehyde alternatives can be attractive as both safer and domestically produced.

Key Drivers

- The LEED rating system is helping to drive the growth of the green building sector, which is now worth \$100 billion.

Challenges for Implementation

- IP concerns. Oregon State University did not want to license the formaldehyde-free adhesive to an end-user such as Columbia Forest Products. The concern was that the company would keep the technology and not share it. The university addressed the problem by connecting with a chemical company that would serve as a go-between.
- Funding. Scaling up the formaldehyde-free adhesive required outside funding. Fortunately, Columbia Forest Products and a chemical company helped pay for piloting and commercialization costs.
- Threats to/tying up intellectual property. A chemical company was interested in the pressure-sensitive adhesive tape made from vegetable oil. However, the company said that it would not license the technology because its own PhDs could create a similar product and patent their version. The chemical company eventually licensed the adhesive tape but has not been selling it, even though it has paid licensing fees for four years. It has not explained why it is not producing the product.
- Opposition from companies and organizations trying to maintain market share/status quo. Opposition forces tried pressuring Oregon State to prevent Professor Li from promoting his formaldehyde alternative. Columbia Forest Products did not foresee the strength of the backlash against it. The opposition has been well funded and has not yet ended.
- Charging more for green products even though costs are not higher. Some cabinet companies would try to charge twice as much for PureBond®, even though the retail price should be comparable to competitors' prices. That creates the false impression in the marketplace that the product is more expensive.

Helpful Actions to Advance Green Chemistry (policies, education, partnerships)

- Health product declarations and environmental product declarations are useful tools that can open markets for producers willing to provide information about the chemicals in their products.
- Don't rule out anyone as a potential adopter. Focus in particular on people in the middle who neither support nor oppose the technology. They may be confused or even threatened by any controversy.
- Be open to unforeseen early adopters. Columbia Forest Products had thought that their strongest supporters would be architects and builders influenced by LEED. However, homeowners started to demand their product for health reasons, especially after Hurricane

Katrina.

- Support early adopters. Columbia Forest Products created the PureBond® Fabricator Network to help early adopters with information, marketing materials, and recognition.
- Don't burn bridges and take the long-term view. Columbia Forest Products was able to collaborate with its competitors a few years ago to lobby against imported Chinese plywood.