

A glue with “mussel” power

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An OSU scientist’s trip to the coast inspired a new adhesive that may revolutionize the wood products industry.



Kaichang Li developed a wood glue based on mussels

One day a few years ago, Kaichang Li was at the Oregon Coast harvesting mussels. When the day was over, in addition to mussels, he returned to Corvallis with questions that led to development of an environmentally friendly wood glue.

Li, an associate professor in Wood Science and Engineering in the College of Forestry at OSU, noticed during his visit to the coast how mussels clung tenaciously to rocks despite being pounded almost continuously by ocean waves.

“I was amazed at the ability of these small mollusks to attach themselves so strongly to rocks,” Li says. “Thinking about it, I didn’t know of any other type of adhesive that could work this well in water and withstand so much force.”

The protein in the small threads the mussel uses to attach itself is an exceptional adhesive, but it’s not readily available. In trying to identify a protein that could be adapted for this purpose, Li had another inspiration—while eating tofu. Soy beans, from which tofu is made, “are a crop that’s abundantly produced in the U.S. and has a very high content of protein,” Li says.

But soy protein lacks the unique amino acid that provides adhesive properties. So his research group went to work and was able to add these amino acids to soy protein, making it work like a mussel-protein adhesive. They’ve also developed other strong and water-resistant adhesives from renewable natural materials using the mussel protein as a model.

Their discoveries have resulted in three pending patents and should lead to a wide range of new products. The research work also has resulted in 11 papers in journals such as *Macromolecular Rapid Communications* and *Journal of Adhesion Science and Technology*.

One of the new adhesives is cost-competitive with a commonly used urea-formaldehyde resin, researchers say, but it doesn’t use formaldehyde or other toxic chemicals. Formaldehyde, which has been used to make wood composites since the 1950s, has been shown to be a human carcinogen, and in some circumstances it may be a cause of “sick building syndrome” when used in building products.

In addition to the environmental advantage, the new adhesives have superior strength and water resistance. “The plywood we make with this adhesive can be boiled for several hours and the

adhesive holds as strong as ever,” Li said. “Regular plywood bonded with urea-formaldehyde resins could never do that.”

[Kaichang Li home page](#)

[OSU news release on development of new adhesive](#)

[Columbia Forest Products announces use of new adhesive in its products](#)