

BOND IT LIKE BYSSI

From the sea: a glue idea for wood

Notable notes in forest research at Oregon State University College of Forestry



Have you ever wondered how mussels hold so tightly to wharves and rocks? Kaichang Li, of the Wood Science and Engineering Department at OSU, did as he struggled to harvest mussels one day. “I was amazed at how the mussels stuck together so strongly,” Li says. “No glue could work in water so well.”

His curiosity is leading to new, environmentally friendly wood glues made from renewable natural resources. Such glues are much in demand. Formaldehyde, one of the ingredients in the currently used wood glues, is associated with several human health problems. The currently used wood glues are based on petroleum, which isn't renewable.

Li researched mussel chemistry. He found out that the secret to their hold-tight ability is a high concentration of a certain amino acid in the threads (byssi) that attach mussels to their substrates. He modified readily available and abundant soy protein with a chemical similar to that in the mussel protein and created a strong, water-resistant wood glue.

Li also found that condensed tannins, which are abundant in tree bark, and wood decayed by brown rot fungus have chemistry similar to that of the amino acid in mussel protein. So he has invented ways to convert bark and rotted wood to effective, environmentally friendly wood glues. Even though rotting wood may seem to be everywhere as you walk through a forest, harvesting enough from natural sources to allow commercial production of adhesives is too expensive and time-consuming. Li's team now is trying to find ways to produce rotted wood on a large scale.

The formaldehyde-free wood glues are good for replacing the resins used in exterior wood composites, but the dark glue lines that they produce are undesirable for interior finishes. To replace the resins used in interior wood composites, Li has developed another formaldehyde-free wood glue based on soy flour. The glue lines are light, and the glue is water-resistant and safe. The walls and furniture for your first apartment might be held together with the glues he developed!

