

Biomaterial engineering: New wood uses can boost local economy

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HOUGHTON - From skyscrapers to car parts to artificial cartilage, all sorts of products made from steel and plastic could be made from wood and other plant products in the near future. With the sixth most timbered land in the country, Michigan could be at the forefront of this biomaterials revolution, and Michigan Technological University is leading the charge.

Late last week, Tech hosted a two-day biomaterials summit, bringing together representatives of several university departments, local economic development leaders and representatives from the downstate Center for Automotive Research. During meetings, lab visits and discussions of specific technologies, the group focused on finding ways to grow the Michigan Forest Biomaterials Initiative, a Tech-led initiative designed to initiate and organize biomaterials research in the state.

"It's universities, industry and the state working together so biomaterials make it to the economy," said Terry Sharik, dean of Tech's School of Forest Resources & Environmental Science.



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From left, Valerie Brugerman of the Center for Automotive Research (CAR), Greg Schroeder of CAR, Michigan Tech Dean of Forestry Terry Sharik and Tech materials science professor Paul Sanders check out a product made from biomaterials in at a lab in Tech's Materials and Minerals building.

Tech professor Mark Rudnicki heads the biomaterials initiative, and said about a dozen educational institutions showed up at the group's first meeting in Gaylord, including several two-year institutions and Michigan State University, which also has a biomaterials program.

Rudnicki said the initiative is working on a proposal requesting \$5 million from the state of Michigan - half to rebuild programs at Tech and MSU - to address industry priorities and create new biomaterial-based products.

"We want to leverage that for even larger federal grants," Rudnicki said, adding the federal government is expected to soon approve \$80 million in grant money for biomanufacturing and related research.

So how big can biomaterials be in the economy?

Well, Quebec just approved a 12-story building with all of its structural members made from cross-laminated timbers, said Rudnicki. Another wood-supported skyscraper just broke ground in Minneapolis, and the process is growing in popularity in Europe.

Cross-lamination, he said, is a process to make large, strong panels out of wood layered in a process similar to plywood, but much stronger. The buildings are shattering the limits of wood construction, which had previously been limited to just a few stories. Tech is attempting to push those limits further, to take advantage of local wood resources.

"The panels are now made of softwood," Rudnicki said. "We want to learn if we can use low-value hardwood."

Feng Zhao, Tech professor of biomedical engineering, is working to chemically modify plant cellulose to make it act like human cartilage.

"Cellulose is the most abundant material from nature, and it has a similar cell structure to the human body," Zhao said, adding that the interface with cellulose fibers and synthetic fibers is the most difficult thing to engineer. Next for her team, she said, is engineering the cartilage so it's biodegradable.

Michigan's biggest industry, and possibly the biggest potential consumer for biomaterials, is the auto industry, and that was a major focus of last week's meetings. Check out tomorrow's Daily Mining Gazette to learn where wood products might be hiding in your next car.

Currently, Rudnicki is the only employee of Tech's forest biomaterials institute, a rebranding of the once popular wood marketing program.

But with grants, industrial demand and the new direction, Sharik hopes to soon find him some company.

"We're trying to recapture the institutional capacity we had," Sharik said. "It's hard to get students involved in wood products. They like biomaterials. Other schools that made the switch grew."

Jeff Radcliffe, Executive Director of the Keweenaw Economic Development Alliance, said the Copper County has great wood resources to capitalize on, though transportation of both raw and finished products could limit manufacturing potential.

"The key is identifying products with high value and low volume," Radcliffe said. "Everything will hinge on the market. If the product is what the market wants, investment will come."