

NEWS

U.S. Endowment for Forestry and Communities to Host the World's Largest Test of Groundbreaking Concrete Infused with Wood

U.S. Endowment for Forestry and Communities, Greenville, SC
For IMMEDIATE RELEASE (December 7, 2018)

The nation's largest public charity dedicated solely to keeping forests as forests and advancing family-wage jobs in forest-rich rural communities plans to showcase a new type of concrete infused with cellulosic nanomaterial at its headquarters.

The U.S. Endowment for Forestry and Communities (Endowment) and its national partners the USDA Forest Service, Oregon State University and Purdue University have been studying a product that can enhance the performance of concrete through the addition of cellulosic nanomaterials (CN) produced from wood. The team is conducting three field applications around the nation: a small sidewalk in Madison, WI; a county bridge deck in northern California, and, the largest commercial test in the world, the Endowment's parking lot in downtown Greenville, South Carolina.

The Endowment will showcase this emerging innovation with a rebuild of the 100 by 40 foot parking lot. The project will involve head-to-head comparison pours of 32 tons of CN enhanced concrete side-by-side with an equal amount of traditional concrete. The long-term goal is to test how well the CN compares to traditional concrete when it comes to reducing carbon emissions, materials used and cost.

"The Endowment is proud to be taking part in this project," said Carlton Owen, the organization's president and CEO. "Our goal is to help make future development more sustainable."

Cellulosic nanomaterials are produced by breaking down wood to its tiniest, strongest components through mechanical and chemical processes similar to making paper. For example, a human hair is approximately 80,000 to 100,000 nanometers wide. The head of a pin is one million nanometers wide. Cellulosic nanomaterials are approximately six nanometers wide.

At the nano scale, materials take on novel properties, said Dr. Alan Rudie of the U.S. Forest Service Forest Products Laboratory. In the case of cellulose, nanomaterials are as strong as steel with only one-fifth the weight. Among other features, they can be used as reinforcing in transparent materials.

"Researchers are testing these cellulosic nanomaterials in a wide range of applications from substrate for flexible computer chips, to composites for car and airplane bodies, lighter and stronger than steel," said Dr. Rudie. "Our team expects that concrete will be among the first commercial applications."

The addition of CN to concrete produces a stronger product which has significant advantages over traditional mix, said Dr. Jason Weiss of Oregon State University. By adding CN, there is a 15 percent gain in product strength. Thus, products could use fewer raw materials and perform just as well.

Addition of these materials could have significant positive benefits for the environment as well. Concrete is largely a mix of small rocks (aggregate), sand, water and cement. Manufacturing cement is an energy intensive process that constitutes about 4 percent of worldwide greenhouse gas emissions. The cement and concrete industries are actively working to reduce the carbon footprint of their products with CN being among the most promising options.

By adding CN to concrete the mixture causes more of the cement to react than in a traditional mix thereby enabling less cement to be used resulting in a reduction in greenhouse gas emissions with equivalent or increased strength. There are other benefits as well, as these materials are not particularly expensive. So, it could be possible to have a win for the planet and for the pocketbook.

But there are even more wins in the forest, said Dr. Rudie. Forest managers are working to restore forests and reduce the risks of catastrophic wildfire and other threats. These management activities largely target low value wood with few markets.

“Removing low value wood is expensive, so finding markets is critical to forest health and sustainability,” he said. “Products made with CN could provide one of the most important answers to keeping our forests as forests and ensuring their health and sustainability.”

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The **U.S. Endowment for Forestry and Communities** (the Endowment) is a not-for-profit public charity working collaboratively with partners in the public and private sectors to advance systemic, transformative, and sustainable change for the health and vitality of the nation’s working forests and forest-reliant communities – www.usendowment.org