

# ScienceNews

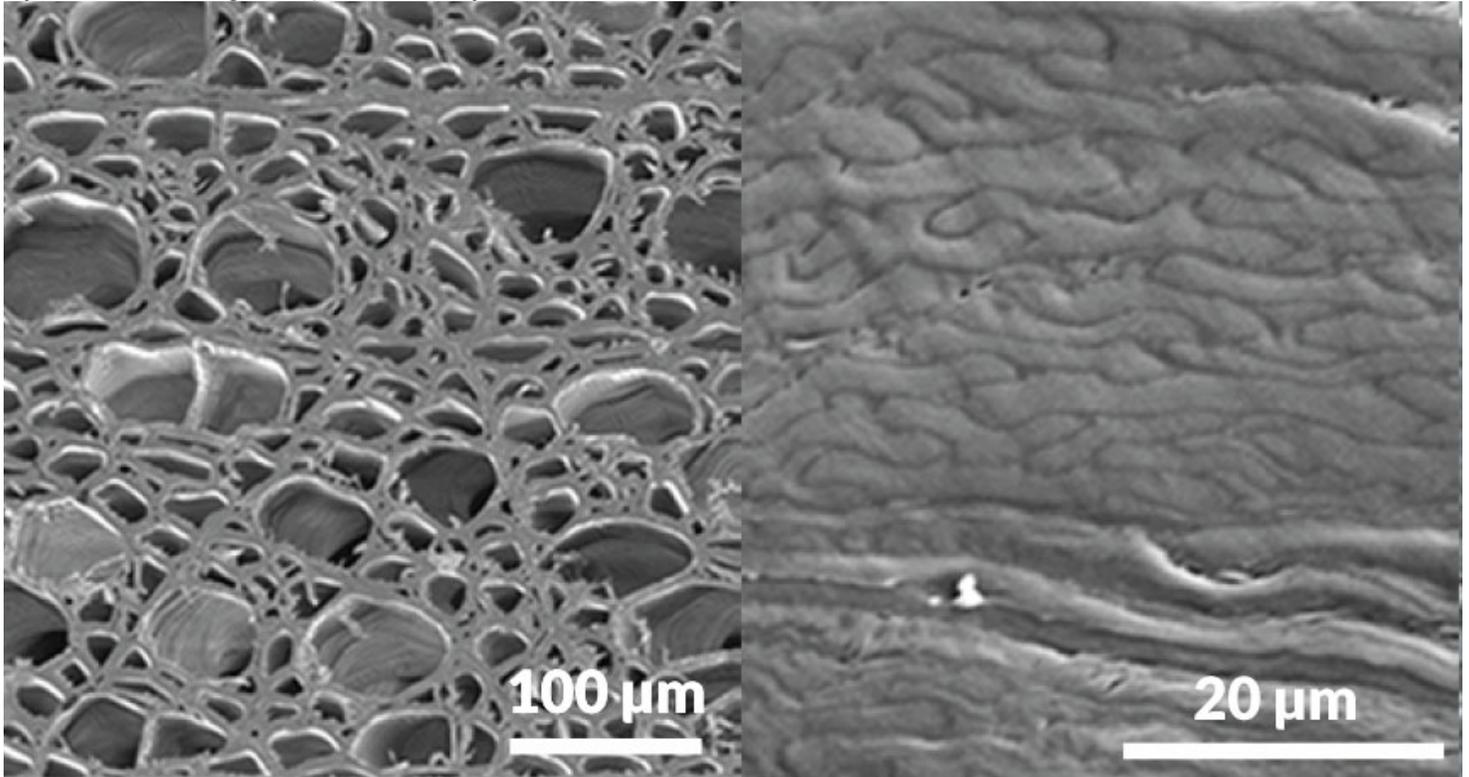
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News in Brief: Materials, Technology

## Superdense wood is lightweight, but strong as steel

*Boiled and crushed lumber could be used to build everything from bridges to cars*

By Maria Temming 1:00pm, February 7, 2018



**TOUGH STUFF** A new wood-compacting process crushes the gaps between cell walls in natural wood (porous structure seen in the scanning electron microscopy image, left), making the densified wood (right) as strong as steel.

J. Song *et al*/*Nature* 2018

[View the video](#)

Newly fabricated superstrong lumber gives a whole new meaning to “hardwood.”

This [ultracompact wood](#), described in the Feb. 8 *Nature*, is created by boiling a wood block in a water-based solution of sodium hydroxide and sodium sulfite. The chemicals partially strip the wood of substances called lignin and hemicellulose, which help give wood its structure and rigidity. Then the block gets squeezed between metal plates heated to 100° Celsius at a pressure of 5 megapascals — about 50 times the pressure of sea-level atmosphere. That squashes the gaps between the cell walls in the wood, shrinking the block to about 20 percent its original thickness and making it three times denser.

Researchers found that the densified wood could withstand being stretched or pulled 11.5 times harder than its natural counterpart without breaking. That makes it about as strong as steel, even though it’s more lightweight. Stainless steel pellets fired from an air gun and moving at 30 meters per second easily busted through a typical wooden plank, but got lodged in a stack of densified wood sheets with the same total thickness.

Chemicals used to process the wood work for various tree species and don’t pose any significant pollution concerns, says study coauthor Teng Li, a mechanical engineer at the University of Maryland in College Park. So

this condensed wood could provide an ecofriendly alternative to steels or alloys for constructing buildings or bridges. It could also be used to manufacture more lightweight, fuel-efficient cars or trains, Li says.

**View the video:**

[https://www.youtube.com/embed/vp24hTzT\\_aw](https://www.youtube.com/embed/vp24hTzT_aw)

**TAKING A BULLET** Air gun pellets are seen in this slow-motion video smashing into three sheets of wood, each 3 millimeters thick but treated differently. The pellet passes through both the top sheet of natural, untreated wood and the middle sheet, which is a single, compressed wood block. But it gets stuck in the bottom sheet, which is composed of five blocks compacted to 0.6 millimeters each.

## Citations

J. Song et al. Processing bulk natural wood into a high-performance structural material. *Nature*. Vol. 554, February 8, 2018, p. 224. doi: 10.1038/nature25476.

## Further Reading

P. Fratzl. Wood made denser and stronger. *Nature*. Vol. 554, February 8, 2018, p. 172. doi: d41586-018-01371-0.

A. Goho. Petrified wood: Quick and easy. *Science News*. Vol. 167, February 5, 2005, p. 85.

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