Uncoated timber burns and cracks when exposed to fire while coated timber (right) has a layer of char that is activated by fire, and protects the timber underneath, preventing the wood underneath from burning. (CREDIT: NTU Singapore)

SCIENCE & TECHNOLOGY NEWS

Fireproof wood? Scientists develop invisible coating that could revolutionize construction industry

AUGUST 19, 2022

by Chris Melore

SINGAPORE — Wood is one of the most common building materials, but it obviously has its weaknesses — namely fire. Now, however, a team in Singapore says they have created an invisible coating which can prevent wood from burning.

Researchers from Nanyang Technological University, Singapore say their invention allows for the "natural beauty" of wood to shine through and only activates through exposure to flames — keeping it fireproof. Current fireproofing methods involve using fire-retardant panels (like gypsum or magnesia boards) or treating the wood with thick mixtures that conceal the natural wood grain. Moreover, the new coating is just 0.075 millimeters thick and transparent, making it invisible to the naked eye.

When hot flames heat the protective coating, a series of complex chemical reactions cause the material to turn into a char that expands to more than 30 times its original size. This char prevents the fire from damaging the wood underneath, lab tests reveal.

“Most timber or wooden panels only have a transparent coat that protects them from moisture, weather corrosion, termites or pests, and are not designed to withstand high heat. Thus, timber can still burn very quickly, especially if it is unprotected,” explains associate professor Aravind Dasari, an expert in fire-retardant materials, in a media release.

“In our coating, we used technology to lock certain compounds and interact with the resin. They will actively participate in the chemical reactions in a systematic manner when exposed to high heat, thus leading to the formation of char. This char was engineered to be extremely heat-resistant, insulating the wood underneath from the high heat.”

NTU Assoc Prof Aravind (left) with PhD student Dean Seah, doing fire tests on timber in the lab. (CREDIT: NTU Singapore)

Revolutionizing the construction industry

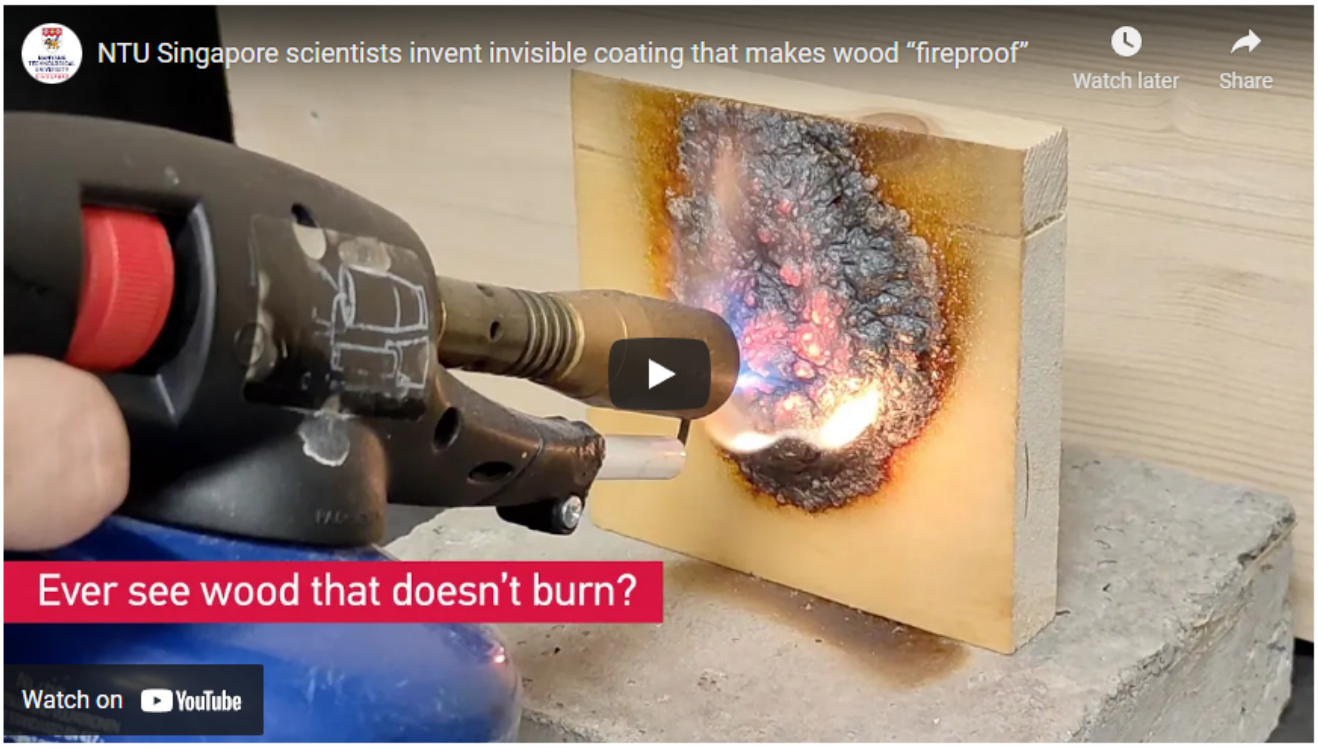
“Leveraging on NTU’s strengths in materials sciences and engineering, this is an example of how fundamental research can be translated into commercial applications with high impact, given that the invisible coating enhances both safety and aesthetics in timber construction with few to no drawbacks,” says NTU Vice President Professor Louis Phee.

“Innovations like this are what NTU can offer to industry players who are keen to work with us to license, commercialize and adapt technologies that can be used to create unique products that will ensure competitiveness for Singapore in the global market.”

Study authors expect this new coating to be in high demand among construction companies, since buildings using wood need to meet specific fire codes set by building regulators.

Right now, there are only a few products that claim to provide both transparency and fire retardance on the market. However, these products are usually very expensive or don't pass international standards for industrial use.

Experiments reveal that when scientists scrap off the char after burning the coating-treated wood, the wood is still intact. Globally, estimates predict the fire-resistant coating industry will grow to over $1.06 billion by 2029.



TAGS: FIRE, FIREPROOF, WOOD