

# Bio-Concrete: Renewable Natural Admixtures for Cement



THE UNIVERSITY OF  
**ALABAMA**

Research &  
Economic Development  
Office for Innovation & Commercialization

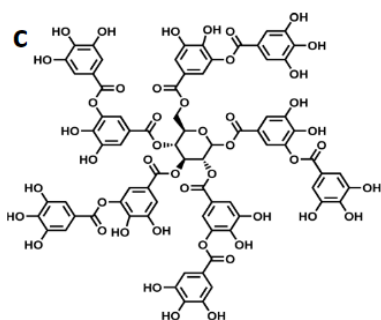
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## The Problem:

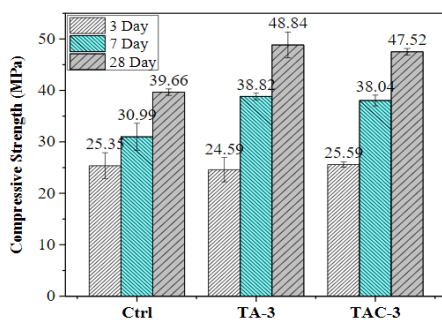
Concrete is the most used artificial material in the world, with about 10 billion tons being produced each year. Unfortunately, its popularity comes with the significant environmental cost: producing approximately 8% of all carbon dioxide emissions worldwide. As more focus is placed on reducing greenhouse gas emissions and aligning with the Paris Agreement on climate change, the concrete industry will need to reduce its emissions by at least 16% by 2030. With this in mind, there is an urgent need to find a greener, more sustainable method to produce more durable concrete.

## The Solution:

Researchers at The University of Alabama have developed a low-cost concrete admixture that uses naturally occurring acidic products to improve compressive strength. The formula also inhibits corrosion of reinforced steel, adds antibacterial function to mortars, and enhances the bonding of new concrete on older existing layers. Testing shows increases the compressive strength of concrete by 20%-70% depending on the usage of other nanoparticles such as nanosilica or nanoclay.



Tannin Compound

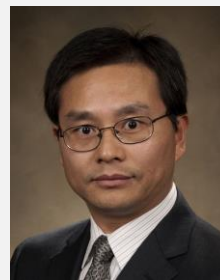


Concrete Samples Made with Tannin Acid

## Benefits:

- Materials are abundant, renewable, & on-toxic
- More cost-efficient than existing materials
- Substantial increases in compressive strength
- Easy to implement into existing systems
- Decreases project time, increases lifetime of concrete structures

## INVENTORS



### Dr. Jialai Wang

Professor, Dept. of  
Civil, Construction,  
and Environmental  
Engineering

**Dr. Wang** received his Ph.D. from the University of Akron in 2003. His research interests include synthesis and characterization of innovative sustainable materials, in-situ nanoparticle production, and adaptive building envelope for multi-hazard mitigation and energy efficiency.

## Honors & Awards

- 2016, Best Paper Award, the 8th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2016) in Hong Kong, China on 14-16 December 2016.
- 2016, Outstanding Paper Award, Fourth International Conference on Sustainable Construction Materials and Technologies SCMT4, 7th -11 August 2016, Las Vegas, Nevada.
- 2010, ASCE ExCEEEd teaching fellow.

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