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# Multifunctional Cement Composites with Load-Bearing and Self-Sensing Properties

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## ABSTRACT

This invention consists of a rapid, simplified, lower-cost method for production of a cement composite with enhanced load-bearing and damage detecting properties.

## FULL DESCRIPTION

As improvements in technology allow for construction of bigger, more uniquely designed skyscrapers, bridges, and motorways that can carry greater loads and are seismically sound, current cement composites are being pushed to their performance limits. Now more than ever, assessing damage to cement composite structures is of integral importance. However, traditional methods can be destructive, subjective, and may not detect previously existing damage, which can be invisible to the naked eye or hidden beneath structural surfaces. Addition of conductive additives, such as carbon nanotubes (CNTs) to cementitious composites attributes both load-bearing and damage self-sensing properties to the composites. However, current formulations and methods for producing these multifunctional cement composites require specialized equipment, are labor, time, and capital intensive, and are not scalable.

UC Davis inventors have identified a method of adding CNT-films to cement composite mixtures that does not require expensive or specialized equipment and overcomes all of the problems presented by current methods. Their formulation maintains load-bearing capacities, while providing significantly enhanced damage sensing properties at a lower cost.

## APPLICATIONS

- ▶ Production of reduced cost damage sensing CNT cement composite for incorporation in load-bearing structures
- ▶ Objective nondestructive damage detection in load bearing structures

## FEATURES/BENEFITS

- ▶ By this method, incorporation of CNTs doesn't require expensive or specialized equipment, is fast, low-cost, efficient, and simple, and can be easily implemented into standard preparation and casting procedures, while still enhancing the composite's material properties.
- ▶ The procedure for preparation requires significantly smaller quantities of nanotubes (and thus lower costs), is scalable, and amenable to large-scale construction.
- ▶ The method does not affect the color or workability of the concrete mix and matrix.

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	<a href="#">10,717,672</a>	07/21/2020	2015-632

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## OTHER INFORMATION

### KEYWORDS

cement composite, load-bearing, bridge, motorway, cement, self-sensing, CNTs, carbon nanotubes

### CATEGORIZED AS

- ▶ **Materials & Chemicals**
  - ▶ Composites
  - ▶ **Transportation**
    - ▶ Other

### RELATED CASES

2015-632-0

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