

# Accepted Manuscript

Fire resistance of ultra-high performance strain hardening cementitious composite:  
Residual mechanical properties and spalling resistance

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PII: S0958-9465(17)30985-X

DOI: [10.1016/j.cemconcomp.2018.02.014](https://doi.org/10.1016/j.cemconcomp.2018.02.014)

Reference: CECO 2999

To appear in: *Cement and Concrete Composites*

Received Date: 2 November 2017

Revised Date: 16 January 2018

Accepted Date: 22 February 2018

Please cite this article as: J.-C. Liu, K.H. Tan, Fire resistance of ultra-high performance strain hardening cementitious composite: Residual mechanical properties and spalling resistance, *Cement and Concrete Composites* (2018), doi: 10.1016/j.cemconcomp.2018.02.014.

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1           **Fire resistance of ultra-high performance strain hardening**  
2           **cementitious composite: residual mechanical properties and spalling**  
3                           **resistance**

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12           **Abstract**

13           Ultra high performance strain hardening cementitious composites (UHP-SHCC) is a  
14           special type of cement-based composite material with outstanding mechanical and  
15           protective performance at room temperature. But its fire performance is unknown and  
16           there is a lack of research in this aspect. This study presents an experimental program  
17           to study fire resistance of UHP-SHCC under two aspects, viz. high-temperature  
18           explosive spalling resistance and residual mechanical performance after a fire. Both  
19           compressive strength and tensile strength of UHP-SHCC were found to deteriorate  
20           with increasing exposure temperature. Tensile strain-hardening feature of UHP-SHCC  
21           would be lost at 200 °C and above. It was found that PE fibers are found not effective  
22           in mitigating explosive spalling, although they start to melt at 144 °C. FE-SEM (Field  
23           Emission Scanning Electron Microscopy) and EDX (Energy Dispersive X-ray)  
24           techniques were used to study the state of fiber, fiber/matrix interaction, and

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