

Accepted Manuscript

Modification effects of nanosilica on the interfacial transition zone in concrete: A multiscale approach

Jing Xu, Binbin Wang, Junqing Zuo



PII: S0958-9465(16)30253-0

DOI: [10.1016/j.cemconcomp.2017.04.003](https://doi.org/10.1016/j.cemconcomp.2017.04.003)

Reference: CECO 2814

To appear in: *Cement and Concrete Composites*

Received Date: 13 June 2016

Revised Date: 16 February 2017

Accepted Date: 10 April 2017

Please cite this article as: J. Xu, B. Wang, J. Zuo, Modification effects of nanosilica on the interfacial transition zone in concrete: A multiscale approach, *Cement and Concrete Composites* (2017), doi: 10.1016/j.cemconcomp.2017.04.003.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **Modification effects of nanosilica on the interfacial** 2 **transition zone in concrete: a multiscale approach**

3 **Jing Xu^{a,*}, Binbin Wang^a, Junqing Zuo^b**

4 ^a Key Laboratory of Advanced Civil Engineering Materials (Tongji University),
5 Ministry of Education, Shanghai 201804, China

6 ^b Shanghai Construction Group, Shanghai 200086, China
7

8 **Abstract**

9 The effects of colloidal nanosilica on the interfacial transition zone (ITZ) in concrete
10 at three days are studied. Mechanical properties are investigated at macro-scale,
11 followed by nanoindentation characterization at micro-scale. A top-down and a
12 bottom-up modelling are carried out, respectively, at macro- and micro-scales.
13 Macro-mechanical results show that nanosilica addition is especially beneficial for the
14 improvement of ITZ performance. Estimates from statistical nanoindentation provide
15 evidence, suggesting that the hydration acceleration effect of nanosilica dominates in
16 the modification of ITZ in an early age. It is revealed by modelling at both scale
17 levels that the ratio of the Young's modulus of ITZ to that of bulk paste increases from
18 around 50% to 80% if nanosilica is incorporated. This work further confirms that a
19 substantial improvement on ITZ can be obtained by ultra-fine nanosilica modification.

20 **Keywords:** Interfacial transition zone; C-S-H; Nanoindentation; Nanosilica

* Corresponding author. E-mail address: 0610060014@tongji.edu.cn (Jing Xu).

Download English Version:

<https://daneshyari.com/en/article/5436836>

Download Persian Version:

<https://daneshyari.com/article/5436836>

[Daneshyari.com](https://daneshyari.com)