Title: Hydration kinetics of cement incorporating different nanoparticles at elevated temperatures

Authors: Guangcheng Long, Yuanyuan Li, Cong Ma, Youjun Xie, Ye Shi

PII: S0040-6031(18)30141-2
DOI: https://doi.org/10.1016/j.tca.2018.04.017
Reference: TCA 77987

To appear in: *Thermochimica Acta*

Received date: 1-3-2018
Revised date: 22-4-2018
Accepted date: 30-4-2018

Please cite this article as: Long G, Li Y, Ma C, Xie Y, Shi Y, Hydration kinetics of cement incorporating different nanoparticles at elevated temperatures, *Thermochimica Acta* (2010), https://doi.org/10.1016/j.tca.2018.04.017

Hydration kinetics of cement incorporating different nanoparticles at elevated temperatures

Guangcheng Long, Yuanyuan Li, Cong Ma[1]*, Youjun Xie, Ye Shi

School of Civil Engineering, Central South University, Changsha, 410075, P. R. China

[1] Corresponding author. E-mail address: macgyh090@csu.edu.cn

Highlights

- The effects of nanoparticles on cement hydration at elevated temperatures were investigated by isothermal calorimeter.
- The nucleation and growth processes of hydration products for nanoparticles modified cement were analyzed by a kinetics model.
- The mechanism of nanoparticles on the hydration kinetics of cement was discussed.

Abstract: The nanometer materials and technology are becoming new ways for cementitious composite innovation due to the significant improvement of microstructure and mechanical performance of cement-based materials. In this study, the isothermal calorimetry was employed to measure the heat release rate and total heat release of multi-scale cement system incorporated with different nanoparticles at elevated temperatures. The nucleation and growth processes of hydration products were simulated through a kinetics model. It is discovered that the effects of nanoparticles on cement hydration depend on itself chemical reactivity and physical properties as well as ambient temperature. Both nano-SiO_2 and nano-C-S-H can obviously shorten the induction period of cement hydration and have acceleration effects obviously. Addition of 1% nano-$CaCO_3$ seems to have no obvious effect on cement hydration process at