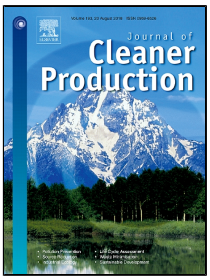
# Accepted Manuscript




Reducing Environmental Impacts and Carbon Emissions: Study of Effects of Superfine Cement Particles on Blended Cement Containing High Volume Mineral Admixtures

Meng Wu, Yunsheng Zhang, Yongsheng Ji, Guojian Liu, Cheng Liu, Wei She, Wei Sun

| | |
|---|---|
| PII: | S0959-6526(18)31729-3 |
| DOI: | 10.1016/j.jclepro.2018.06.079 |
| Reference: | JCLP 13225 |
| To appear in: | *Journal of Cleaner Production* |
| Received Date: | 01 April 2018 |
| Accepted Date: | 08 June 2018 |

Please cite this article as: Meng Wu, Yunsheng Zhang, Yongsheng Ji, Guojian Liu, Cheng Liu, Wei She, Wei Sun, Reducing Environmental Impacts and Carbon Emissions: Study of Effects of Superfine Cement Particles on Blended Cement Containing High Volume Mineral Admixtures, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.06.079

# Reducing Environmental Impacts and Carbon Emissions: Study of Effects of Superfine Cement Particles on Blended Cement Containing High Volume Mineral Admixtures

Meng Wu[a], Yunsheng Zhang[a]*, Yongsheng Ji[b], Guojian Liu[a], Cheng Liu[a], Wei She[a], Wei Sun[a]

[a] *Jiangsu Key Laboratory for Construction Materials, Southeast University, Nanjing 211189, PR China 221116*

[b] *State Key Laboratory for Geomechanics and Deep Underground Engineering, China University of Mining and Technology, PR China Xuzhou*

** Corresponding author: Yunsheng ZHANG, Email: zhangys279@163.com*

**Abstract**: A novel green cement which was prepared with superfine Portland cement and high volume solid wastes (fly ash and blast furnace slag) was investigated in this study. The mechanical performance, heat of hydration, particle packing density, evolution of hydration products and microstructure of this novel blended cement were studied and compared to the conventional blended cement. Moreover, the energy consumption and carbon emission of novel green cement were calculated. The effects of superfine cement in blended cement were systematically studied and compared to Portland cement (PC). Test results showed that a notable improvement in the mechanical properties of novel green cement was achieved compared to conventional blended cement. Even the mechanical properties and workability of novel green cement were very close to PC. The calculation based on mixtures indicated that the energy consumption and carbon emissions of novel green cement containing 70 wt% mineral admixtures only reached 47.3% and 40.9%, respectively, of those of PC. The analysis suggested that the superfine cement increased the packing density of blended cement and effectively accelerated the hydration of mineral admixtures to form a refined and dense microstructure, which is key for preparing high-performance green cement. This research provided guidance for developing low carbon and environmentally friendly cement.

**Keywords**: Green cement; Solid wastes; Microstructure; Environmental impacts; Hydration products