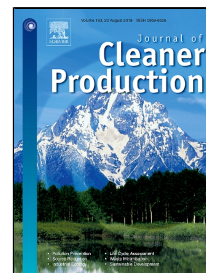


# Accepted Manuscript

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



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

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10  
11 **Abstract:** A novel green cement which was prepared with superfine Portland cement  
12 and high volume solid wastes (fly ash and blast furnace slag) was investigated in this  
13 study. The mechanical performance, heat of hydration, particle packing density,  
14 evolution of hydration products and microstructure of this novel blended cement were  
15 studied and compared to the conventional blended cement. Moreover, the energy  
16 consumption and carbon emission of novel green cement were calculated. The effects  
17 of superfine cement in blended cement were systematically studied and compared to  
18 Portland cement (PC). Test results showed that a notable improvement in the  
19 mechanical properties of novel green cement was achieved compared to conventional  
20 blended cement. Even the mechanical properties and workability of novel green cement  
21 were very close to PC. The calculation based on mixtures indicated that the energy  
22 consumption and carbon emissions of novel green cement containing 70 wt% mineral  
23 admixtures only reached 47.3% and 40.9%, respectively, of those of PC. The analysis  
24 suggested that the superfine cement increased the packing density of blended cement  
25 and effectively accelerated the hydration of mineral admixtures to form a refined and  
26 dense microstructure, which is key for preparing high-performance green cement. This  
27 research provided guidance for developing low carbon and environmentally friendly  
28 cement.

29  
30 **Keywords:** Green cement; Solid wastes; Microstructure; Environmental impacts;  
31 Hydration products

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