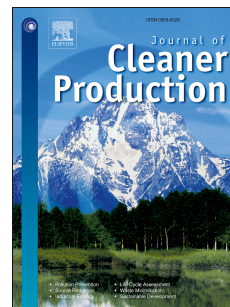


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Physico- chemical and mechanical characterization of high volume fly ash incorporated and engineered cement system towards developing greener cement

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Abstract

High volume fly ash (HVFA) concretes are not gaining acceptance in construction industry because of low strength. The low strength of HVFA cement systems can be improved by suitable engineering of the mixes through incorporation of micro and nano materials. In the present study, hydration mechanism has been altered and engineered through incorporation of calcium carbonate (CC) obtained from various sources and efficacies of using CC have been examined through physico-chemical and mechanical characterization. Calcium carbonate obtained from egg shell and lime sludge (a paper industry waste) as well as commercially obtained micro- and nano- calcium carbonate are used in HVFA cement system to accelerate the hydration. It is found that the excess presence of silica from HVFA is utilized to develop hydration products by supplying calcium as an external source, to solve the perennial problem of reduction in strength due to HVFA in cement. Further, it is found that with the incorporation of nano (NC) and micro (LS) CC, it is possible to recover the loss in strength of 60% cement replacement upto 98% and 65% of the original matrix respectively. It is revealed from the hydration studies that the strength gained is not only dependent on the formation of calcium silicate hydrate (C-S-H) but depends also on the other hydration products such as carboaluminates. Moreover, net benefits of using

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