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Alkali activation of fly ash in self-consolidating concrete at low molar concentration

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Abstract

As a means of minimising the negative effects on the environment, the use of industrial byproducts in the building industry is becoming more popular. Recently, alkali activation of precursors has boomed in the market since activation of precursors improves mechanical properties and reduces the carbon footprint. However, one risk factor in alkali activation is molar concentration. This is because the increase in the molar concentration of sodium hydroxide/sodium silicate and the release of volatile substances from those acids is more harmful to the environment. Therefore, the present study investigates the activation of the precursor at low molar concentration, thereby equalising performance through the dosage of superplasticisers. In this regard, fly ash was activated at 5 M sodium hydroxide (NaOH) and replaced cement at varying percentages in the range of 0–30% by weight. The performance of self-consolidating concrete (SCC) was evaluated through fresh and hardened characteristics and microstructural analysis. The blended mixtures of SCC, activated fly ash (AFA) at 5 M sodium hydroxide, 0.89% of superplasticisers and 15% of replacement performed better than the control SCC. The outcome of the present study will provide a platform for activating a precursor at low molar concentration through the influence of superplasticisers.

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References

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