

BENEFITS OF ADDING CALCIUM HYDROXIDE TO METAKAOLIN-BASED GEOPOLYMERS ON FAST SETTING AND STRENGTH ENHANCEMENT

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Ca compounds are used in geopolymers and alkali-activated materials to accelerate setting. The effectiveness, however, can be erratic and the mechanism of fast setting is not clearly understood. It might be because the unstandardized, different combination of feedstocks in each case and the reaction products still include substantial amount of amorphous phases. We investigated the effect of some calcium compounds on the setting time in metakaolin-based geopolymers having the fixed ratio of ingredients ($\text{Na}_2\text{O} : \text{Al}_2\text{O}_3 : \text{SiO}_2 : \text{H}_2\text{O} = 1 : 1 : 4 : 10$). Calcium compounds were added at dosages from 1% to 4% of the total mix weight. The final setting time of the 1:1:4:10 composition geopolymers was presumed to be over 24 hours at ambient temperature. Ca hydroxide was vastly superior to Ca oxide and carbonate in accelerating setting, and Ca carbonate even retarded the setting of geopolymers. Adding 2% of $\text{Ca}(\text{OH})_2$ concurrently increased the compressive strength by about 12% from 68 MPa to 76 MPa. Calcium hydroxide probably decreases the modulus of the alkaline activator at low dosage and resulted in gaining higher strength. An overdose of calcium, a glass modifier, might depolymerize the molecular structure of geopolymers and cause dehydration cracking.