

Hydration Behavior of Belitic Cement in the Presence of Na_2CO_3 , NaOH , KOH , and Water Glass

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Abstract : This study provides insights into the role of alkalis in modifying the hydration kinetics and microstructural development of β -dicalcium silicate, highlighting potential pathways for enhancing the performance of belite-based cements in various construction applications. It investigates the behavior of β -dicalcium silicates ($\beta\text{-Ca}_2\text{SiO}_4$) when hydrated in various alkaline environments, including deionized water and solutions containing 2M concentrations of Na_2CO_3 , NaOH , KOH , and water glass. The dicalcium silicate was synthesized with laboratory reagents, calcium carbonate, and gel silica. The hydration process was carried out over different periods, ranging from 7 to 90 days. The hydrated samples were characterized using X-ray diffraction, infrared spectroscopy, and scanning electron microscopy, while the mechanical strength tests were performed at 28 and 90 days. The results indicate that the presence of alkalis significantly influences the hydration of belite cement. Early hydration is accelerated, which is evident from the faster dissolution of C_2S , a decrease in C_2S peaks, and the formation of C-S-H products, including sodium-containing C-(N)-S-H and potassium-containing C-(K)-S-H.

Keywords : dicalcium silicate, alkali activator, hydration, water glass, Na_2CO_3 , NaOH , KOH

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