

Hydration reactions in tricalcium silicate by XRD and combined techniques

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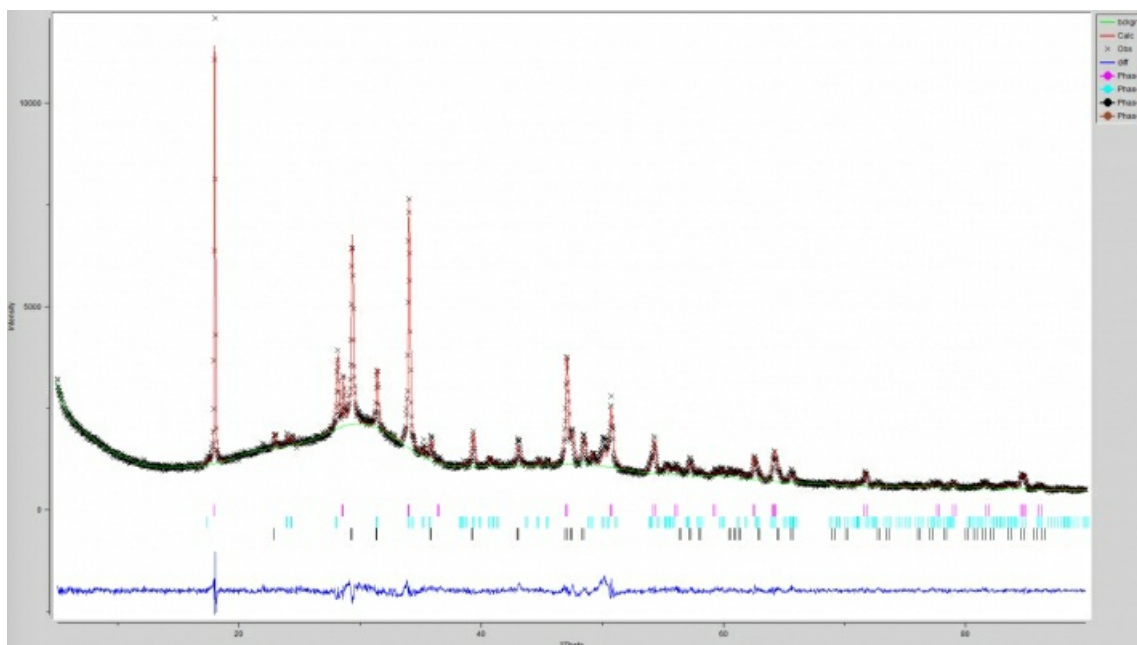
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The tricalcium silicate hydration products were studied by quantitative analysis by the Rietveld method of crystalline phases at time intervals of 30 min, 4 hours, as well as 1, 7, 14, 21 and 28 days. The evolution of the different phases present was further studied by differential scanning calorimetry, thermogravimetric analysis, pH, chemical analysis and compressive strength. Combining the results of the crystalline phase composition and thermogravimetric analysis, a procedure was established to estimate the amount of amorphous calcium silicate hydrate (CSH) as a function of time, as well as the proportion of portlandite and other phases. The results showed a complete hydration reaction at 28 days, during which the tricalcium silicate disappears completely. The formation of portlandite occurs at 24 hours and subsequently shows a tendency to decrease, while CSH increases its proportion during the time interval studied. At 30 min and at 4 hours, no changes were observed in the phase composition of the hydrated paste. From chemical analysis, the CSH can have a structural arrangement of the jaffeite type [1] or other structural types than can be discussed in the presentation. The cohesion of CSH particles is analyzed on the light of the model suggested by Jönsson [2]. The figure below shows a Rietveld refinement for the sample paste at 21 days of hydration.

[1]. Richardson I.G. (2008). Cement and concrete research 38, 137-158.

[2]. Jönsson B. (2004). Langmuir 20, 6702-9.



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