Rheological Investigations on Thermally Reactivated Cement Pastes with Varying W/C-Ratios

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Abstract:

One of the most prominent challenges of today's world is the reduction of CO2-emissions. A promising approach to lower the carbon footprint of the construction industry is based on the reactivation of cement stone from concrete waste via thermal treatment and thus recovering its hydration ability.

Various researchers have noted that the water demand of reactivated cement is higher than for industrially produced Portland Cement (OPC). However, the quantification of the rheological properties of rehydrated reactivated cements has been neglected. This research sets the objective to improve the understanding of the rheological behavior of reactivated cements and intends to create a data basis as a reference point in further research.

Reactivated cement powders have been produced using different reactivation temperatures and have then been mixed with varying water/cement-ratios to obtain the cement pastes which were then used to perform the rheological tests. Additionally, the phase composition has been determined via X-ray diffraction (XRD) measurements and the morphology of the cement grains was examined with a scanning electron microscope (SEM).

The results highlight the differences in water demand between OPC and reactivated cements. It can be observed that the water demand increases with the reactivation temperature at which the cement has been treated. XRD and SEM analysis offer a first explanation for the observed phenomena.