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Synchrotron Powder Diffraction Study of Cement Pastes

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The degree of hydration of cement pastes is critical for determining properties such as the durability of concrete. As part of an integrated study on the prediction of chloride ingress in reinforced concrete, synchrotron X-ray powder diffraction was used to estimate the degree of hydration of cement pastes. While for the past 20 years the composition of Portland cement has been determined by Rietveld analysis of X-ray diffraction, nevertheless there are a number of factors, including the amorphous content of the cement and relative proportion of mineral polymorphs present in the initial clinker, whose impact on the analysis are still not completely understood. X-ray powder diffraction beamlines from The Brazilian Synchrotron Light Laboratory (LNLS) and The Australian Synchrotron were used to analyze a suite of production cements from both countries. The results showed significant differences in degree of hydration and composition in the two cements.

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