

Recycling of hydrated cementpastes by synthesis of alpha'(H)-C2S

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Resumen

Hardened cement paste in concrete wastes can be a valuable precursor material for the production of recycled cements. In the reported study, X-ray diffraction data of cementitious materials obtained by thermal processing of hardened pastes were quantitatively analyzed using Rietveld refinement to explain the effect of process parameters on their hydration reactivity and on the strength gain of pastes made with them. The parameters studied were annealing temperature, residence time, and cooling rate. Across the annealing temperature range explored C2S polymorphs were found to comprise the larger fraction of the resulting materials. However, their relative concentrations varied. Results indicate alpha'(H)-C2S formed at low temperature is highly reactive and remains stable on cooling due to its smaller crystallite size, whereas at higher temperatures most of it converts to the less reactive beta-C2S on cooling. Accordingly, materials obtained at lower temperatures exhibited higher heats of hydration and much higher strength gain rates.

Palabras clave

Palabras clave de autor: Thermal treatment; Ca₂SiO₄; X-ray diffraction; Crystal size; Waste management

KeyWords Plus: CRYSTAL-STRUCTURE REFINEMENTS; NEUTRON POWDER DIFFRACTION; DICALCIUM SILICATE; PHASE-STABILITY; CONCRETE; CA₂SIO₄; POLYMORPHS