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Stability of the hydrate phase assemblage in Portland composite cements containing dolomite and metakaolin after leaching, carbonation, and chloride exposure

Alisa Machner^{1,3,*}, Maciej Zajac², Mohsen Ben Haha², Knut O. Kjellsen¹, Mette R. Geiker³, Klaartje De Weerd³

¹Norcem AS, R&D Department, Setreveien 2, P.O. Box 38, 3991 Brevik, Norway

²Heidelberg Technology Center GmbH, Oberklammweg 2-4, 69181 Leimen, Germany

³NTNU Department of Structural Engineering, Richard Birkelandsvei 1A, 7491 Trondheim, Norway

*Corresponding author: alisa.machner@ntnu.no
+47 45394622

ORCID-ID: 0000-0002-6334-5116

Abstract

To reduce CO₂ emissions during the production of cement and to cope with increasing demands for concrete, and thereby cement, the cement industry needs to identify new supplementary cementitious materials. These new composite cements should provide, among others, a similar or improved durability of the concrete structures. This study investigated the hydrate phase assemblage in Portland cement pastes containing dolomite or a combination of dolomite and metakaolin after leaching, carbonation, and chloride exposure. The phase assemblage and phase compositions of the exposed samples and the unexposed reference samples were investigated using TGA, XRD, and SEM-EDS. The reaction of dolomite in the cement paste resulted in the formation of hydrotalcite. It was found that, unlike most other hydration phases, hydrotalcite can withstand high degrees of leaching and carbonation. When the samples were exposed to a chloride solution, the formation of a chloride-containing hydrotalcite was observed.

Keywords:

Dolomite; Metakaolin; Blended cement; Leaching; Carbonation; Chloride exposure

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