**Nanocomposites and nanomaterials**

**Effects of nanosilica and seawater on the early-age performance of blended cements**

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Ordinary Portland cement (OPC) is the most energy-intensive, costly, and environmentally unfriendly component of conventional concrete. The cement industry is responsible for 5 to 8% of the total anthropogenic CO2 in the atmosphere, and the cost of cement represents more than 45% of the overall cost of conventional concrete. To tackle this challenge, researchers have been investigating replacing OPC with alternative binders (so-called blended cements). In the last decades, the search for alternative binders has grown in popularity, with studies into the use of fly ash, ground-granulated blast-furnace slag, silica fume, rice husk ash, and others. These materials are known to enhance durability-related properties of concrete. However, these materials can significantly reduce development of early-age strength.

The goal of this study to produce sustainable cementitious composite with satisfactory early-age performance based on Portland composite cement (CEM II) or blast furnace slag cement (CEM III), seawater and nanosilica (NS). The interaction of blended cements with nanosilica and seawater was evaluated by isothermal calorimetry and compressive strength development tests. In transport properties (water porosity, sorptivity) as well as microstructural investigations of cement mortars were performed.

Study showed that seawater has a noticeable effect on the early strength development of blended cement systems. In addition, the incorporation of NS has a significant effect on accelerating the strength development of cement pastes from the first day of the hydration process. In addition, positive effect of seawater and nanosilica on microstructural and transport properties was reported. Therefore, combination of seawater along with nanosilica enables to produce sustainable cementitious composites containing blended cements.

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