Rheological characterization of different clay minerals for sustainable pourable clay concrete

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Abstract

This study focuses on revitalizing an age-old building material, clay, due to its minimal environmental impact. To make clay as versatile as traditional cement-based concrete, it must be pourable to avoid physically demanding labor-intensive construction. Additionally, the diverse behavior of clay, influenced by its origin and mineral composition, significantly impacts pourability, water absorption, and, consequently, the drying process. This complex relationship highlights the importance of understanding its rheological properties, especially with the method of small amplitude oscillatory shear (SAOS), to investigate the nature of interactions. To address these challenges, clays with varying chemical and mineralogical compositions were tested. Firstly, mini-cone spread tests with different volume concentrations (ϕ) have been conducted to define the water demand. Secondly, the same clay minerals at different ϕ were investigated with SAOS. This approach enables rapid assessment of the physico-chemical properties of clay pastes. This process could select real clay pastes for developing pourable clay concrete formulations in the future.