



Experimental Investigation of Self-compacting High Performance Concrete Containing Calcined Kaolin Clay and Nano Lime

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Abstract

The aim of this research is to investigate the effect of pozzolanic materials and nano particles on improve the strength characteristic by the properties of a self-compacting high-performance concrete that includes calcined clay with nano lime. In this study, two blends systems are worked on, they are the binary and the ternary systems. For binary mixtures, test samples were prepared from 5% CC, 10% CC, 15% CC and 3% NL by partial replacement of the cement weight. While ternary mixtures, samples were prepared from 5% CC 3% NL, 10% CC 3% NL and 15% CC 3% NL by partial substitution of cement weight. The tests conducted on mixes are fresh tests like slump flow diameter, V-funnel, L-box, and segregation resistance. The compressive strength test was determined at 7, 28 and 56 days. While splitting tensile strength tests at 7 and 28 days from the SCHPC produced in the study. It was concluded that the replacement of CC and NL in SCHPC binary mixes reduced the fresh results enough for SCHPC production and gave a general improvement in the compressive strength and splitting tensile strength properties of the SCHPC mixture. SCHPC with 10% CC partial replacement of cement showed higher values of compressive and splitting tensile strength, compared to the reference mixture of SCHPC for all days, thus it was considered the best. Whereas, the strength of the concrete mixtures in the ternary cement mixtures was better than the strength of the mixing and control mortar systems for the same replacement levels in 7, 28 and 56 days.

Keywords: Strength; Calcined Clay; Nano Lime; Self-Compacting High Performance Concrete (SCHPC).

1. Introduction

High-Performance Self-Compacting Concrete (SCHPC) is a special type of concrete. It combines the requirements of two types of concrete, namely, self-compacting concrete and high-performance concrete. Self-Compacting Concrete (SCC) is concrete that fills the mold and spreads during heavy reinforcement under the influence of its weight and does not require vibration [1]. Requirements for self-compact concrete include good filling ability, high passing ability, and ability to resist segregation. But it does not include durability and high resistance. Whereas, on the contrary, High Performance Concrete (HPC) is one of its most important requirements, and does not need its ability to filling and passing well [2]. To produce high performance self-compacting concrete, we need cement additives, which are useful for improving resistance, durability and segregation resistance. Also, we need high range water reducers, which are useful for achieving workability and passing ability [3]. The high-performance self-compacting concrete (SCHPC) has a high powder amount and little water content, while it has a lot of fine aggregate and little coarse aggregate compared to normal concrete [4].

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