Thesis Title	Strength and Durability of Calcium Carbide Residue - Fly Ash Concrete Activated Strength with Various Methods
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Abstract

This research aimed to study strength and durability of calcium carbide residue - fly ash concrete activated strength with various methods. Calcium carbide residue was mixed with fly ash at a ratio of 30 : 70 by weight and used as a new cementing material to cast concrete. All concrete mixtures had a water to binder ratio of 0.25 and superplasticizer was employed to control slump of fresh concrete between 15 and 20 cm. There were three activation methods to promote strength development of a new cementing material which were (1) adding 1% of NaOH by weight of binder, (2) curing concrete at elevated temperature of 60 °C, and (3) increasing the fineness of calcium carbide residue and fly ash by grinding (the particles retained on a sieve No 325 were less than 3% by weight). All concrete was tested to determine the mechanical properties such as compressive strength, splitting tensile strength, and modulus of elasticity. For durability of concrete, water permeability, chloride resistance, corrosion of embedded steel bar, and drying shrinkage were investigated.

The results showed that all activation methods could improve strength of concrete made from calcium carbide residue and fly ash mixture and increasing the fineness of a new cementing material was the most effective method compared with other methods. The compressive strength of concrete activated by increasing the fineness of a new cementing material could be as high as 561 ksc at 28 days and increased up to 664 ksc at 90 days. Concrete made from calcium carbide residue and fly ash mixture had elastic modulus and splitting tensile strength similar to that of Portland cement concrete.

In addition, all activation methods had no significant effects on elastic modulus and splitting tensile strength of concrete.

The values of water permeability of concrete made from calcium carbide residue and fly mixture ranged from 12.51×10^{-13} to 3.72×10^{-13} m/s, depending on its compressive strength, while that of Portland cement concrete ranged from 7.91×10^{-13} to 4.19×10^{-13} m/s. Chloride resistance of concrete in terms of chloride ion penetration and corrosion of embedded steel bar could be considerably improved by all activation methods. Finally, drying shrinkage of concrete activated by increasing the fineness of a new cementing material was lower than that of Portland cement concrete.

Keywords : Calcium Carbide Residue / Fly Ash / Water Permeability / Chloride Resistance / Steel Corrosion / Drying Shrinkage / Strength Activation