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KEY WORD:

FLY ASH / HYDRATION REACTION / POZZOLANIC REACTION / THERMOGRAVIMETRY ANALYSIS

WISSAWA CHAKPAISARN : EFFECTS OF FLY ASH IN POZZOLANIC REACTION ON COMPRESSIVE
STRENGTH OF HIGH PERFORMANCE CONCRETE. THESIS ADVISER : PROF. EKASIT LIMSUWAN,
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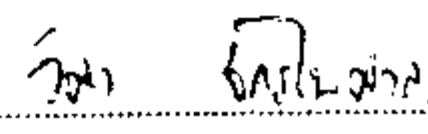
A chemical reaction between cement and water known as "hydration reaction" produces calcium silicate hydrate and calcium hydroxide. Using fly ash substitution of cement in concrete, chemical components in fly ash will react with calcium hydroxide to produce calcium silicate hydrate by means of pozzolanic reaction. Matrix of the paste will condensed by calcium silicate hydrate from hydration reaction and pozzolanic reaction, so that compressive strength of concrete will be increased. This study, calcium hydroxide has been tested and determined by Thermogravimetry Analysis (TGA), and calcium silicate hydrate can be calculated and determined by molecular weight of chemical composition. Strength and physical properties have been tested to compare with thus chemical reactions. The thermogravimetry analysis can determine amount calcium hydroxide in cementitious phase by thermal heating up to 450-600 °C for decomposition as that weight loss of calcium hydroxide. The study has considering fly ash substitution at 15-35 % for concrete mixes at 500 kg./m³ cement content. Essential concrete property in fresh and harden states had been determined along with age respectively.

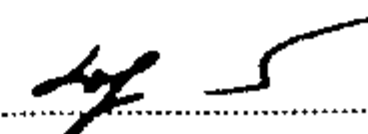
The amount of calcium hydroxide in cement paste is tested to be increased by age of hydration reaction. Fly ash substitution in cement will reduce amount of calcium hydroxide by means of pozzolanic reaction by 0.6-0.8 % at 28 days and 1.38-1.56 % at 56 days. Reduction of calcium hydroxide in the paste has proved the pozzolanic reaction to be increased by age and the amount of calcium hydroxide in cement paste with fly ash tends to overcome the one of cement paste around 2 weeks of age. Total amount of calcium hydroxide in cement paste substituted by fly ash is proportioned to the amount of cement in the paste. The amount of calcium silicate hydrate in cement paste with fly ash has shown larger amount about 5 % at 28 days and 10 % at 56 days over the ordinary cement. It is proved that the pozzolanic reaction is increased with age. Then long term strength compression had indicated direct proportion to the amount of calcium silicate hydrate in concrete. The strength increase rate has shown at 10 % of fly ash substitution. Workability of fresh concrete can also be improved by means of fly ash in term of slump at every 10 % substitution. The appropriate replacement of fly ash should be around 25 % for soundness, 15 % for compressive strength and 35 % for workability. Modulus of elasticity of concrete with fly ash is tested to greater values than that the prediction by ACI Committee 363 in the range of 35-40 %. Mortar with fly ash had indicated more shrinkage than mortar of ordinary mortar about 2-10 %.


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