Tikumporn Thubpo 2013: Strength and Fire-Resistance of Class C and Class F Fly Ash Geopolymer Paste. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering.
Thesis Advisor: Associate Professor Prasert Suwanvitaya, Ph.D. 115 pages.

The research presents the results of a study on the compressive strength of geopolymers produced using Class C fly ash (CFA) and Class F fly ash (FFA) when subjected to elevated temperatures. The geopolymers used were synthesized with sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH) solutions, and specimens included three concentrations of NaOH (4, 8, and 12 M); the fly ash content ranged from 50, 55, 60, 65 and 70 percent by weight. A 10 mm-thick geopolymer panel was used for the fire resistance tests.

From the experimental results reported in this study, it can be concluded that the thermal stability of fly ash-based geopolymer is dependent on the concentration of NaOH and the fly ash content. The thermal stability of the geopolymer materials prepared with high concentrations of NaOH was quite low. Materials prepared using high fly ash content had better thermal stability than geopolymers prepared using low fly ash content. Geopolymer materials prepared using low concentrations of NaOH and high fly ash content showed good fire resistance as well as low heat conduction through the geopolymer, especially in temperatures above 800°C. The strength loss and fire resistance characteristics showed improvement when the NaOH concentration was decreased and the fly ash content increased. This study demonstrated that the loss of compressive strength of fly ash-based geopolymer when exposed to firing was associated with a significant increase in average pore size, and that, consequently, elevated temperature strength is dependent on pore size and the total porosity percentages of geopolymer paste specimens.

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