



“Gheorghe Asachi” Technical University of Iasi, Romania



FACTORS AFFECTING THE WORKABILITY AND STRENGTH OF ALKALI-ACTIVATED HIGH CALCIUM FLY ASH CONCRETE

Krit Chaimoon¹, Sittiporn Pantura¹, Sahalaph Homwuttiwong¹,
Athika Wongkvanklom¹, Prinya Chindaprasirt^{2*}

¹Division of Civil Engineering, Faculty of Engineering, Maharakham University, Maharakham 44150, Thailand

²Sustainable Infrastructure Research and Development Center, Department of Civil Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen 40002, Thailand

Abstract

The effects of several parameters on the workability and strength of alkali-activated high calcium fly ash (AAHCFA) concrete were investigated in this study. The AAHCFA concretes were activated with alkali sodium hydroxide solution (NaOH), sodium silicate solution (Na₂SiO₃) and heat. Three alkali liquid to fly ash (L/S) ratios of 0.55, 0.60 and 0.65, three NaOH concentrations of 10, 15 and 20 molars (M) and three Na₂SiO₃/NaOH ratios of 1.0, 1.5 and 2.0 were used. The workability was obtained by measuring the slump and the compressive strength was tested to gauge the strength of concrete. The results revealed that the workability of AAHCFA concrete was related to the molar ratio of H₂O/Na₂O in activator, the NaOH concentration, and the L/S ratio. The improvement in compressive strength was mainly related to the increase in the NaOH concentrations. The strength was, however, reduced with the increase in the Na₂SiO₃/NaOH ratio. The obtained slumps were in the range of 70 to 260 mm and the 28-day compressive strength ranged from 9.0 to 47.5 MPa. The influence of delay time (the time taken from the completion of specimen casting to the start of heat curing), curing temperature and curing duration on compressive strength were also presented.

Key words: alkali-activated material, compressive strength, concrete, high calcium fly ash, workability

Received: September 2010; Revised final: August, 2011; Accepted: September, 2011

* Author to whom all correspondence should be addressed: email: prinya@kku.ac.th; Phone: +66 4320 2355; Fax: +66 4320 2355 x 12