

An investigation of the behaviour of raw calcareous fly ash in mortar mixtures

Ioanna Papayianni¹, Eleftherios Anastasiou¹

¹Aristotle University of Thessaloniki, Aristotle University Campus, 54124, P.O. Box 482, Thessaloniki, Greece

KEYWORDS: raw calcareous fly ash, mortars, pozzolanicity

ABSTRACT

The behaviour of unprocessed calcareous fly ash in mortar and cement mixtures is often questionable and unpredictable, which is one of the difficulties in confining these fly ashes within the limits of standards. This work aims at correlating the material characteristics with its behaviour, in an effort to better understand how this fly ash with three reactive constituents; lime (CaO), silica (SiO₂) and sulfates (SO₃), performs in a mortar mixture, in relation to strength development, thermal loads and moisture changes. Two raw calcareous fly ashes of different composition emanating from the Ptolemaida area, Greece, were systematically tested to find their profile as cementitious agents that could be incorporated in a cement mortar mixture, replacing part of the cement. Apart from chemical composition, mineralogical analysis of their phases was carried out by X-ray diffraction, DTA-TG analysis and SEM microscopy, by which the cenosphere content was estimated. Fineness was measured by sieving and laser particle size analysis to see the most prevalent size of grains. For volume stability and water demand of the mixtures, the corresponding EN Standards were followed. An adequate number of mortar specimens were prepared for testing pozzolanicity index with lime and with cement at ages of 7, 28 and 90 days. The rate of hydration was monitored by using DTA-TG methodology for the determination of Ca(OH)₂. The behaviour of these mixtures under thermal loads was also recorded as well as shrinkage deformations under low RH (<65%). Evaluating all the results, some proposals are made for the improvement of the effectiveness of raw calcareous fly ashes without any processing.

Submitted for consideration in the 2009 World of Coal Ash Conference, May 4-7, 2009.