Topic: Utilization of Al-Containing Waste and Rice Husk Ash in Autoclave Aerated Concrete

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ABSTRACT

The aim of this study was to examine the effects of Al-containing waste (AW) fineness and rice husk ash (RHA) on the physical, mechanical and microstructural properties of autoclaved aerated concrete (AAC) produced under different curing conditions and autoclaving times and temperatures. The RHA and AW were used as an aggregate and pore-forming agent, respectively, at various replacement ratios. The results demonstrated that RHA and AW substitutions for sand and metallic aluminium powder, except for 5% medium and low AW fineness ratios, were associated with a reduction in compressive strength and dry density. The increase in autoclaving temperature to 180 °C accelerated the compressive strength to be in equilibrium within a shorter time than low temperatures of 140 and 160°C. Under different curing conditions, autoclaving times and temperatures, dry density remained stable. In terms of the microstructure, tobermorite formation depended on several factors, including autoclaving time and temperature, reactivity and the content of siliceous materials, and the fineness and concentration of AW. The RHA substitution for sand induced the formation of tobermorite during the first 2 hour of autoclaving time at 180°C, whereas CSH gel formed at the reference. This suggested that the high reactivity of RHA has a tendency to reduce the autoclaving time or autoclaving temperature required. The introduction of high fineness and replacement ratio of AW led to retardation in converting CSH to tobermorite at 180°C for 4 h. However, under prolonged autoclave curing, the Al species that were adsorbed on the siliceous materials were decomposed, and either normal or Al-substituted tobermorite as formed.

Keyword: rice husk ash, Al-containing waste, aerated concrete, autoclave, compressive strength, microstructure