

A study on the synthesis of fly ash-based lightweight aggregate geopolymer concrete

Abstract

The experiments conducting for current investigation aimed to study the synthesis process for lightweight aggregate geopolymer concrete (LWAGC) and explore the significance and limitations of the activator content on the compressive strength using the same mix design. The LWAGC was synthesized by the alkali activation of a fly ash (FA) as the source material by mixture of liquid alkaline activator. The resultant LWAGC possessed a compressive strength of 18.86 MPa at age of 28 days with oven-dry density of 1438.7 kg/m³. The Activator/FA mass ratio has been investigated at a range of 0.3-0.7, and shows a significant effect on the workability and compressive strength of the LWAGC. The results reveal that the activator content proposed by the standard mix design was at the optimum content level, since it provides a suitable workability for the fresh concrete and the highest compressive strength for the hardened concrete. The results demonstrated that the usage of an activator content, at levels either less or more than the suggested quantity deteriorated the properties of the resultant concrete. The significant result of the current study was to offer proof of the reliability of the ACI 211.2-98 standard used for designing and mix proportioning of OPC lightweight aggregate structural concrete in the production of LWAGC

Keywords

Alkaline activator; Fly ash; Geopolymer; Lightweight concrete