Chang-Geun Cho, J Material Sci Eng 2017, 6:3 (Suppl)
DOI: 10.4172/2169-0022-C1-065

Utilization of blast furnace by-product in application of highductile fiber-reinforced cement-free composites

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Of the building materials, cement or cement-based materials are the main binding material (Cho et al, 2012; Lee et al, 2012). However the carbon dioxide (CO_2) produced in the cement manufacturing process represents up to about 7% of global manmade CO2, and cement also has a high level of toxicity. The purpose of this research is to develop a sustainable and eco-friendly building material, which is called a high-performance ductile Fiber-Reinforced Cement-Free Composite (FRCFC). FRCFC is manufactured using Ground Granulated Blast-Furnace Slag (GGBS) based alkali-activated cement-free fiber composites. Two mixture proportions, both of which had proper flowability and viscosity of mortar in order to easily mix and uniformly disperse fibers, were determined according to alkali activators and the slump flow. Compression, direct-tension, and bending tests on the developed cement-free composites were conducted in order to evaluate the mechanical properties of composites. The developed cement-free composites showed an average of 465mm slump flow and about 2% of the tensile strain capacity based on multiple micro-cracks. The test results demonstrate the feasibility of high ductile fiber-reinforced cement-free composites as sustainable building materials.

Biography

Chang-Geun Cho has his expertise in development and applications of high performance fiber-reinforced cement and concrete composite in architectural building structures. He received PhD in the field of concrete and structures in the department of architectural engineering, Tokyo Institute of Technology, Japan, 2000. From 2009, he is working and educating at school of architecture, Chosun University, Republic of Korea. He had initially attempted to develop a strain-hardening fiber-reinforced cementless composite (Lee & Cho et al., 2012). Currently he is serving as a managing editor in International Journal of Concrete Structures and Materials, Springer.

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