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Mechanical and Electrical Properties of Fly Ash Geopolymer Composited with Short Carbon Fibre

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Workability, compressive strength and electrical properties of high calcium (Class C) fly ash geopolymer composited with short carbon fibre (CF) were investigated. The liquid to ash (L/A) ratio was kept at 0.4, while the carbon fibre concentration, curing temperature and age of the specimens were varied. The fibre content was in a range of 0-0.5%CF. The curing temperature was 25℃ and 60℃ and the specimens were tested at the age of 7, 14 and 28 days. The workability of freshly mixed geopolymer paste was tested by miniature slump cone testing method. The workability decreased when higher content of CF was added. However, the compressive strength was improved and reached the maximum value of 31.3 MPa at 0.5%CF. I-V curve measurement and cyclic voltammetry (CV) techniques were used for electrical properties determination. The alternative current, with the maximum current of 100 mA, was applied to the specimens. It was found that the CF concentration significantly affected the electrical resistivity. The lowest resistivity was obtained with 0.5%CF addition. For 25℃ curing, longer curing day led to the increase in electrical resistivity whereas it was almost unchanged for 60℃ curing temperature. In the case of CV measurement, the measurement was carried out at 28 days age. The CV curves showed the dependence on curing temperature, CF content and scan rate. X-ray diffraction pattern and Fourier transform infrared spectra confirmed that CF addition did not change the chemical structure of the geopolymer.

Keyword: fly ash geopolymer; geopolymer composite; carbon fibre; electrical properties; mechanical properties

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