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## Effect of Carbon Fiber and Nano-Silica Addition on the Microstructure, Electrical and Mechanical Properties of Fly Ash Geopolymer

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Geopolymer is an environmental friendly construction material which has a potential for replacing cement. In the present study, the addition of carbon fiber and nano-silica in geopolymer paste was studied in terms of the electrical and mechanical properties, and the microstructure. The geopolymer paste was made from fly ash by blending it in  $\text{Na}_2\text{SiO}_2/\text{NaOH}$  solution using the liquid/ash ratio of 0.4. Up to 2 wt% of nano-silica and 5 wt% of carbon fiber were added in geopolymer paste. In each mix, the workability of the paste was tested and controlled using a mini-slump test. After casting, the composite pastes were cured at 25C or 60C for 24 hr. The property and microstructure measurements were performed at 7, 14 and 28 days. For the electrical property, the I-V curve of each sample was measured using a 4-point probe method. The electrical resistivity generally increased with nano-silica addition but decreased with carbon fiber content. On the other hand, mechanical test showed that the compressive strength did not have a clear trend when any additive was mixed. The phase formation and functional groups were analysed using X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) while the fractured surface morphology after compression was investigated under a scanning electron microscope (SEM).

Keywords: geopolymer; carbon fiber; nano-silica; electrical property; compressive strength

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