

## Microstructural and Mechanical Properties of Geopolymers Synthesized from Three Coal Fly Ashes from South Africa

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### ABSTRACT:

In this study, coal fly ashes (CFAs) from three different boiler sites in South Africa, Eskom (E coal fly ash), George Mukhari Academic Hospital (GMH coal fly ash), and KarboChem (KBC coal fly ash), were used to produce geopolymers. The coal fly ashes were pretreated with a mixed alkali activator solution of sodium silicate ( $\text{NaSiO}_3$ ) and sodium hydroxide ( $\text{NaOH}$ ). The geopolymer pastes were cured in an oven at  $60\text{ }^\circ\text{C}$  for 10 days and further cured at room temperature for 18 days. The microstructure and mechanical properties of the geopolymers were evaluated by scanning electron microscopy energy dispersive spectroscopy (SEM-EDS), X-ray diffractions (XRD), Fourier transform infrared (FTIR), thermogravimetric (TG), and compressive strength analyses. The compressive test results obtained showed that the E and KBC geopolymers have higher strength than GMH-CFA geopolymers. Similar results were obtained in the FTIR and SEM-EDS analyses. This indicates that E-CFA and KBC-CFA are more reactive and hence they have a higher degree of geopolymerization when compared to GMH-CFA.