

## Energy-efficient Buildings In Construction Industry Using Fly Ash-based Geopolymer Technology

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**Abstract :** The aim of this study was to investigate the influence of nanoparticles additive on the properties of fly ash-based geopolymer. The geopolymer samples were prepared using fly ash as the primary source material, along with an alkali activator solution and different concentrations of carbon black additive. The effects of nanoparticles flexural strength, water absorption, and micro-structural properties of the cured samples. The results revealed that the inclusion of nanoparticles additive significantly enhanced the mechanical and electrical properties of the geopolymer binder. Micro-structural analysis using scanning electron microscopy (SEM) revealed a more compact and homogeneous structure in the geopolymer samples with nanoparticles. The dispersion of nanoparticles particles within the geopolymer matrix was observed, suggesting improved inter-particle bonding and increased density. Overall, this study demonstrates the positive impact of nanoparticles additive on the qualities of fly ash-based geopolymer, emphasizing its potential as an effective enhancer for geopolymer binder applications for the development of construction and infrastructure for energy buildings.

**Keywords :** fly-ash, geopolymer, energy buildings, nanotechnology

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