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# Mechanical and thermal properties of lightweight geopolymer composites

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## Abstract

This research has investigated the properties of thermally insulating geopolymer composites that were prepared using waste expanded polystyrene as lightweight aggregate. The geopolymer matrix was synthetized using metakaolin and an alkaline activating solution. To improve its mechanical properties, this matrix was modified by the addition of an epoxy resin to form an organic-inorganic composite. Moreover, in order to reduce drying shrinkage marble powder was used as an inert filler . The materials obtained were characterized in terms of physico-mechanical properties, thermal performance and microstructure. The geopolymer expanded polystyrene composite have improved properties compared to Portland cement-based materials, with higher strengths and lower thermal conductivity. The research demonstrates the manufacture of sustainable lightweight thermally insulating geopolymer composites using waste expanded polystyrene.

**Keywords:** Expanded polystyrene, geopolymer, composite, thermal insulation.