

**Title :** Development of Foamed Glass from Recycled Glass and Bottom Ash for Use as Thermal Insulation Materials

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## ABSTRACT

The objective of this research was to develop foamed glass prepared by a wet process using cullet powder and bottom ash as the major raw materials, together with inorganic fillers and a foaming agent, in combination water as the solvent. The mixture was mechanically foamed using a high-speed mixer until a viscous slurry was obtained. The slurry was then poured into a high-alumina mold (12 × 12 × 4 inches), dried at 40 °C, and fired at 850 °C with heating rates of 2 and 3 °C/min, followed by furnace cooling. After cooling, the foamed glass was cut into specimens with dimensions of 12 × 12 × 1 inches. The properties of the foamed glass were investigated, including pore structure, average pore size, water absorption, bulk density, compressive strength, and thermal conductivity. The experimental results revealed that the foamed glass showed a uniform cellular structure with an average pore size of 1.6 mm. The water absorption and bulk density were 49% and 0.4 g/cm<sup>3</sup>, respectively. The compressive strength was 2.45 MPa, and the thermal conductivity was 0.1 W/m·K, demonstrating its potential for use as a thermal insulation material. The average pore size decreased at a heating rate of 2 °C/min, while the bulk density and compressive strength increased with increasing bottom ash content. In addition, the surface of the foamed glass was coated with a zinc oxide nanoparticle solution using a spray-coating technique, and its antibacterial activity was evaluated. The coated foamed glass showed antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, and *Aspergillus niger*.

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