EVALUATION OF PROPERTIES OF AN INORGANIC ADHESIVE AS AN INORGANIC FILLER UNDER A HIGH-TEMPERATURE ENVIRONMENT

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Abstract— With buildings consuming more than 30% of energy globally, it is necessary to improve the performance of heat insulating materials to contribute to the proliferation of energy-saving buildings. Heat insulating materials with varying performance are layered, and the different materials are attached using adhesives, which can be largely classified into organic adhesives and inorganic adhesives. Organic adhesives produce toxic materials during fires, whereas inorganic adhesives weaken due to condensation. Against this backdrop, this study introduced an inorganic filler to improve the adhesive strength and heat resistance of inorganic adhesives.

The inorganic adhesive used in this study was sodium silicate solution, and the filler contained varying ratios of calcium carbonate and a fire-resistant additive. Viscosity was adjusted by adding a small amount of water. Ultrasonic dispersion was employed for uniform distribution of the inorganic adhesive, and adhesion and combustion tests were conducted to evaluate the adhesive properties. Shear adhesion was measured in accordance with KS F 2218, and fire resistance was tested by using a torch to directly heat the adhesive.

The results showed that shear adhesion became stronger with increasing amounts of calcium carbonate and fire-resistant additive. Swelling was not observed in fire resistance tests. The introduction of calcium carbonate and the fire-resistant additive contributes to overall strength improvement, and helps to prevent deformation of the inorganic adhesive during combustion.

Index Terms—Inorganic adhesives, Thermal insulation materials, Shear compressive test, Flame test.