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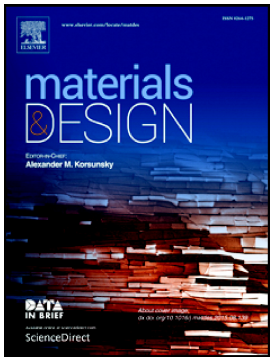

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Control of shaping and thermal resistance of metakaolin-based geopolymers

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Abstract

This paper presents results from experimental studies on the thermal resistance and dilatometry analysis of various geopolymer formulations, which were prepared by mixing alkaline solutions, metakaolin and reinforcements. Nine compositions were tested by dilatometric analysis and thermal resistance at high temperature (800°C). Structural and microstructural analysis was conducted to verify the geopolymerization, and differential thermogravimetric analysis was performed to evaluate the nature of water, depending on the formulation. Some key parameters were identified as critical parameters that influenced the geopolymer properties, such as the nature (Na or K) and the molar concentration of the alkaline cation ([M] < 16 mol/L), the molar concentration of silicon ([Si] < 39 mol/L) and the alkaline metal to aluminum ratio (M/Al < 0.65). Finally, it was possible to arrange the various formulations in a ternary scheme as functions of the metal, aluminum and silicon concentrations. This scheme may represent a roadmap for controlling the thermal resistance of geopolymer materials.

Keywords

Geopolymer, reinforcement, thermal resistance, dilatometry, DTA, microstructural analysis