

The Influence of Microcapsulated Phase Change Materials on Thermal Performance of Geopolymer Concrete

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Abstract : The total energy consumption is dramatically increasing on over the world, especially for building energy consumption where a significant proportion of energy is used for heating and cooling purposes. One of the solutions to reduce the energy consumption for the building is to improve construction techniques and enhance material technology. Recently, microcapsulated phase change materials (MPCM) with high energy storage capacity within the phase transition temperature of the materials is a potential method to conserve and save energy. A new composite materials with high energy storage capacity by mixing MPCM into concrete for passive building technology is the promising candidate to reduce the energy consumption. One of the most utilized building materials for mixing with MPCM is Portland cement concrete. However, the emission of carbon dioxide (CO₂) due to producing cement which plays the important role in the global warming is the main drawback of PCC. Accordingly, an environmentally friendly building material, geopolymer, which is synthesized by the reaction between the industrial waste material (aluminosilicate) and a strong alkali activator, is a potential materials to mixing with MPCM. Especially, the effect of MPCM on the thermal and mechanical properties of geopolymer concrete (GPC) is very limited. In this study, high thermal energy storage capacity materials were fabricated by mixing MPCM into geopolymer concrete. This article would investigate the effect of MPCM concentration on thermal and mechanical properties of GPC. The target is to balance the effect of MPCM on improving the thermal performance and maintaining the compressive strength of the geopolymer concrete at an acceptable level for building application.

Keywords : microencapsulated phase change materials, geopolymer concrete, energy storage capacity, thermal performance

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