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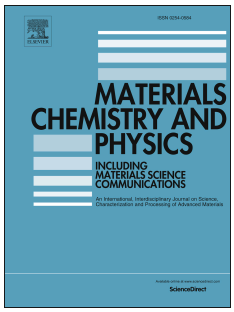

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The influence of gibbsite in kaolin and the formation of berlinite on the properties of metakaolin-phosphate-based geopolymer cements

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Abstract

Two different kaolins (Kao1, Kao2) containing about 11 and 28% of gibbsite were applied for producing metakaolin-phosphate-based geopolymer cements. These kaolins were transformed to metakaolins by calcination them at 700 °C. Gibbsite contained in these kaolins were transformed to γ-Al_2O_3 during the calcination. The hardener used in this work was a phosphoric acid solution with molar concentration 10M. It could be observed that the compressive strength of metakaolin-phosphate-based geopolymer cements (54.41/36.01 MPa) decreases in the course GMK1/GMK2. The both geopolymer cements indicate the formation of berlinite which is well dispersed in GMK1 and therefore reinforced the structure of the specimen. The micrograph images of phosphate-based geopolymer cements GMK2 is heterogeneous while the one of the GMK1 is homogeneous and more compact microstructure. The higher content of gibbsite in Kao2 affects negatively the mechanical and microstructural properties of metakaolin-phosphate-based geopolymer cements.

Keywords: Metakaolin, Gibbsite, Hardener, Geopolymer cements, Berlinite.

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1- Introduction

Geopolymer is essentially a chemical compound consisting of repeating units of silico-oxide (Si-O-Si), silico-aluminate (Si-O-Al-O-), ferro-silico-aluminate (-Fe-O-Si-O-Al-O-), or alumino-phosphate (-Al-O-P-O-), created through a process of geopolymerization [**1**]. The reaction takes place in alkaline (Na^+, Li^+, K^+, Ca^{2+} or acidic (phosphoric or humic acid) medium. The geopolymerization reaction through an alkaline medium has been studied extensively, and the effect of the mineralogical composition of a raw aluminosilicate on geopolymerization and final properties have already been reported. The acidic medium for geopolymer synthesis is still less investigated and there is scanty information on the effect of