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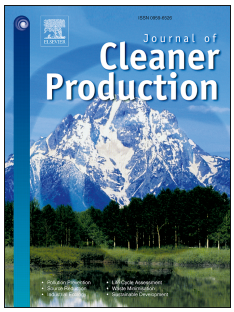

Microstructural study of environmentally friendly boroaluminosilicate geopolymers

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Microstructural study of environmentally friendly boroaluminosilicate geopolymers

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Abstract

This paper is investigating a more environment-friendly type of alkali-activated materials so-called boroaluminosilicate geopolymer (BASG). The microstructural and thermal behaviour of boroaluminosilicate geopolymers is studied using Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA) respectively. The chemical bonds forming the geopolymeric network as well as the reaction of the matrix at the elevated temperatures up to 600°C are investigated. Different combinations of sodium silicate, sodium hydroxide solution and borax are utilised to activate fly ash. The effect of boron ions, from the alkaline solution, on forming geopolymer gel is the main idea of the study. FTIR spectroscopy shows that not only boron ions have an undeniable influence on the formation of geopolymer compounds but also the change in the ratio of sodium silicate has a significant role in the gel homogeneity of aluminosilicate products. Existence of peaks relating to boron compounds is an evidence to the formation of the BASG binder. These peaks vary as the composition of the activator are changed. In addition, TGA results reveal that the water molecules embedded within the matrix could be one of the main reasons for changing the mechanical characteristics. Loss of water at temperatures above 200°C is in a similar pattern with the strength development of samples. It illustrates the significant role of water molecules in the geopolymer structure.