AIP Conference Proceedings Volume 2291 2 November 2020 Article number 0023188 7th International Conference on Advanced Material Engineering and Technology Seoul 29 November 2019through 30 November 2019 Code 164726

Synthesis and characterization of metakaolin geopolymer-MgO NPs green composite for heat protection

Abstract

The main objective of this study was to produce and characterize green material for heat protection based on metakaolin geopolymer-MgO nanoparticles. Metakaolin geopolymer was produced through alkali activation method and acted as a binder or matrix to MgO NPs which was prepared via hydroxide precipitation followed by thermal decomposition of the hydroxide at 750°C for 2 hours. The concentration of MgO NPs was varied from 0, 4, 8 and 12% relative to the mass of metakaolin. The mixture between geopolymer and MgO NPs was molded in accordance to the characterization purposes, and cured at 70°C for 2 hours. The resulting composites were then stored at room temperature in open air for 28 days before performing any measurements. The functional groups between geopolymer species (Si-O-Al) and MgO NPs were examined by using Fourier Transform Infrared (FTIR). The ability of the composite to contain thermal (heat) energy as a function of MgO NPs concentration was measured by using Differential Scanning Calorimetry (DSC) from 25°C to 400 °C with a heating rate at 20°C/minute. The heat resistance of the composite was measured by inserting the samples inside nabertherm furnace at 600°C as well as 800°C for 2 hours. The samples were able to withstand 600°C and 800°C and still integrated although their compressive strength were decrease. The results showed that geopolymer-MgO NPs is an excellent green composite for heat protection.