

Factorial design approach to investigate the significance of factors on the fire resistant, compression and adhesion properties of geopolymer binder

ABSTRACT

Despite numerous studies on the factors which influenced the properties of the geopolymer binder have been conducted, the effect of different factors on the properties of geopolymer binder was not well determined. In this research, geopolymer materials were analyzed and profiled using a statistical approach called 2-level fractional factorial design (2-FrFD). The objective is to screen and identify important factors affecting the behaviour of geopolymer binder. MINITAB, a statistical software, was used to design the experiment, analyze data obtained and present the significance value of the factors via chart and plots. The result showed that the curing temperature (V3) did not have a significant effect on the fire resistant properties of the geopolymer binder with the p-value of 0.526. Other factors and interaction were significant with RHA/AA ratio (V2) was the most significant factor with the coefficient value of 135. For the compression strength properties, all factor and interactions were significant (p-value between 0.000 and 0.009) with the RHA/AA ratio (V2) recorded the highly significant factor with the coefficient value of 8.838. For adhesion strength properties, NaOH concentration (V4) and curing time (V5) were found to be insignificant with the p-value of 0.223 and 0.133, respectively. Other factors and interaction were significant curing temperature (V3) was the most significant factor with the coefficient value of 0.287. This result may hugely benefit future researchers, towards producing halal and sustainable polymer, in determining the suitable factors which have a significant effect of the properties (outcome) of the geopolymer binder.

Keyword: Geopolymer; Factorial design; Statistical analysis; MINITAB