

Refractory Properties of Alumina/Silica Blend

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Abstract: *In this paper, refractory properties of a blend of alumina/silica fired at 800, 900 and 1,000 °C for varying times of 30 minutes, 1, 3, and 5 hours are validated against those of standard indigenous kaolinitic clay. Characterisations of the indigenous clay and blend using X-ray fluorescence complemented with X-ray diffraction (XRD) in relation to literature revealed that the indigenous clay is essentially siliceous alumina-silicate containing about 51% silica and 40% alumina with high content of alkali oxide but low ferrous oxide content. XRD analysis of the synthetic alumina/silica blend showed that the firing temperature and time only had significant effect on the phase transformation at temperature of 1,000 °C and time of 5 hours. At this condition, marginal presence of tridymite was identified in the alumina/silica blend. Further refractory tests of shrinkage, bulk density, water absorption rate, apparent porosity, cold compression strength reinforced with scanning electron micrography present pronounced colour variation in the indigenous kaolinitic clay across the firing conditions which is absent in the alumina/silica blend. The synthetic alumina/silica blend exhibits refractory properties that approximate those of standard alumina-silicate for refractory purposes. Linear shrinkage in the refractory blend is within permissible limit of 0-4%, bulk density 1.55-1.89 g/cm³, water absorption is 21.7-30.4 % while compressive strength is in the range 1,125-2,017 KN/M². The apparent porosity at 45% is however outside the standard for fireclay refractory. These results suggest that a blend of alumina/silica can be explored for refractory purpose.*

Keywords: *Firing conditions, morphology natural clay, refractory properties, silica-alumina blend*