

Hydrothermal conversion of kaolin to kalsilite (KAlSiO_4): the effect of K_2CO_3 concentrations

ABSTRACT

Kaolin was used as a silica and alumina precursor in the hydrothermal synthesis of kalsilite with the addition of potassium carbonate (K_2CO_3) as a potassium source. The effects of different K_2CO_3 concentrations have been studied. After a 24-hour hydrothermal reaction at 200°C , kaolin treated with 1.25M K_2CO_3 shows 28.7° , 34.2° , and 42.3° as the most significant peaks under X-ray diffraction (XRD) which corresponds to hexagonal kalsilite. In addition, Field emission scanning electron microscopy (FESEM) images also revealed hexagonal particles proving the formation of the desired kalsilite. At K_2CO_3 concentrations less than 1.0M, boehmite and bayerite were identified to be the primary products while kalsilite forms as a minor crystalline phase. Hexagonal kalsilite was observed as the major product at higher ($>1.0\text{M}$) K_2CO_3 concentration while the reaction kept constant at 200°C .