
The Exothermic Reaction of Metakaolinite in the Presence of Mineralizers. Influence of Crystallinity

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Abstract: This paper presents further results concerning the nature of the exothermic reaction of meta-kaolinite near 950° C. In a previous work (Lemaitre *et al.*, 1975), we proposed that the exothermic effect had a double origin: (a) direct formation of mullite, promoted by CaO and (b) formation of a segregated spinel-type phase, i.e. $\gamma\text{-Al}_2\text{O}_3$, promoted by MgO.

In this paper, we examine the influence of a further parameter on the reaction sequence, namely the crystallinity of the starting kaolinite as defined by Hinckley's index (c.i.; Hinckley, 1963). By combining X-ray and DTA techniques it is shown that the direct mullite formation path (a) occurs readily at 900° C in well-ordered kaolinite, but not in poorly ordered samples, even when fired with CaO. On the other hand, path (b) can be promoted in all samples using MgO as a mineralizer. When the indirect reaction path (b) occurs, a second exothermic effect is observed at approximately 1200° C indicating secondary mullite formation by recombination of segregated silica and alumina phases. This effect occurs in poorly ordered kaolinites even in the presence of CaO [path (a) promotor] indicating that path (b) is the most probable reaction mechanism in very disordered kaolinites.

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