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Kinetics of the reactive sintering of kaolinite-aluminum hydroxide extrudate

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Abstract

The kinetics of the reactive sintering process of the extrudate made of a kaolinite and aluminum hydroxide mixture is investigated by means of stepwise isothermal dilatometry (SID) accompanied with XRD, SEM and other techniques. We find that the process can be divided into three stages in total, and the isothermal shrinkage data can be well-fitted according to Makipirtti's Meng equation: $dY/dt = nk(T)Y(1-Y)[(1-Y)/Y]^{1/n}$, where Y is the fractional densification function. The apparent activation energy E_a values are obtained as 2972 ± 461 kJ mol⁻¹ for 950–1100 °C, 1056 ± 74 kJ mol⁻¹ for 1200–1300 °C, and 792.7 ± 17.0 kJ mol⁻¹ for 1300–1450 °C. The sintering shrinkage mechanisms in different temperature ranges are discussed, with reference to phase, pore and microstructure development. This study is helpful to control the microstructure and properties of the porous mullite-corundum ceramics.



Keywords

D. Al₂O₃; Kinetics; Kaolinite; Stepwise isothermal dilatometry; Porous mullite-corundum ceramics

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