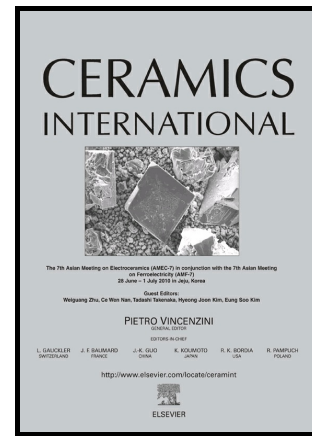


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Low-temperature sintering and microstructure control of mullite-Mo composites

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Abstract:

Dense mullite-Mo (45 vol.%) composites with homogeneous microstructure have been obtained by plasma activated sintering of a mixture of Mo and mullite precursors at a relatively low temperature (1350 °C) and a pressure of 30 MPa. The mullite precursor was synthesized by a sol-gel process followed by a heat-treatment at 1000 °C. The influence of different mullite precursors on the densification behavior and the microstructure of mullite–Mo composites has been studied. The precursor powder heat-treated at 1000 °C with only Si-Al spinel but no mullite phase shows an excellent sintering activity. Following the sintering shrinkage curves, a two-stage sintering process is designed to enhance the composite densification for further reducing the sintering temperature. The study reveals that viscous flow sintering of amorphous SiO₂ at low temperatures effectively enhances the densification. Moreover, microstructure of these composites can be controlled by selecting different precursors and sintering temperatures.

Keywords: A. Sol-gel process; A. Two-stage sintering; B. Composites; D. Microstructure

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