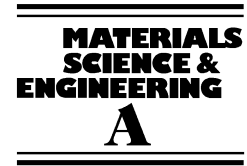




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Use of partially oxidized SiC particle bed for microwave sintering of low loss ceramics

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Abstract

A 1 kW hybrid microwave system was fabricated using a partially oxidized SiC powder bed and used to sinter small components of low-loss insulating ceramics. Samples of 3% yttria stabilized zirconia/20% alumina (3YZA) and 99% alumina were sintered to final densities of 99%(3YZA) and 95%(99% alumina). Partially oxidized silicon carbide (β -SiC) powder was used as susceptor (preheater). By comparison, unoxidised β -SiC powder, which couples well with microwaves at room temperature, exhibited thermal runaway above 400°C. It could be possible that at high oxidation levels the connectivity between SiC particles in β -SiC powder bed might become depercolated, and a model similar to one proposed for silicon nitridation under microwaves could be appropriate in understanding the microwave absorption phenomenon. Stable temperature measurements at various positions in the system confirmed that the maximum temperature was at the center of the 3YZA sample. The plot of the relative temperature difference between the sample and its surroundings as a function of sample temperature resulted in a bell-shaped curve with a clear maximum at around 800°C, associated with the rapid increase in radiation heat transfer above this temperature. Experiments also confirmed that sintering occurred at lower temperatures in a microwave field when compared to conventional sintering. © 1999 Elsevier Science S.A. All rights reserved.

Keywords: Hybrid microwave heating; Oxidized silicon carbide; Depercolation; Sintering
