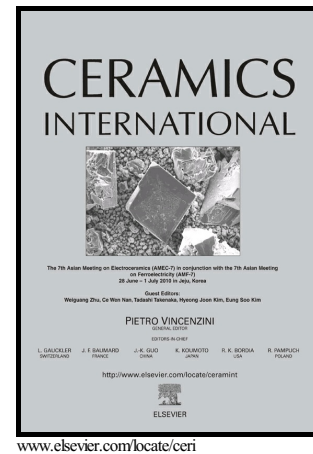


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Densification improvement of spark plasma sintered TiB₂-based composites with micron-, submicron- and nano-sized SiC particulates

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Abstract

Taguchi design of experiments methodology was used to determine the most influential spark plasma sintering (SPS) parameters on densification of TiB₂-SiC ceramic composites. In this case, four processing factors (SPS temperature, soaking time, applied external pressure and SiC particle size) at three levels were examined in order to acquire the optimum conditions. The statistical analysis identified the sintering temperature as the most effective factor influencing the relative density of TiB₂-SiC ceramics. A relative density of 99.5% was achieved at the optimal SPS conditions; i.e. temperature of 1800 °C, soaking time of 15 min and pressure of 30 MPa by adding 200-nm SiC particulates to the TiB₂ matrix. The experimental measurements and predicted values for the relative density of composite fabricated at the optimum SPS conditions and reinforced with the proper SiC particle size were almost similar. The mechanisms of sintering and densification of spark plasma sintered TiB₂-SiC composites were discussed in details.

Keywords: Spark plasma sintering; Densification; TiB₂; SiC; particle size.

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