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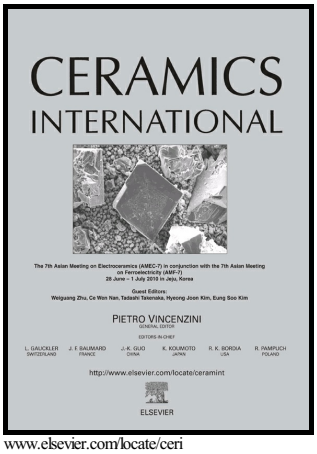

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Nanostructured SiC prepared by ultra low temperature densification using amorphous/nano-crystalline bimodal Si-Al-C powder

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Abstract

Mechanical alloying and spark plasma sintering were used to fabricate dense and nanostructured SiC at 1525°C under 40 MPa pressure. Round-shaped nanopowder (d_{50}: 108 nm) consisting of amorphous Si-Al-C and β-SiC crystallites was prepared using high-energy ball-milling. Aluminum was homogeneously distributed in the Si-Al-C powder. The addition of Al during the milling process caused the decrement in the 3C-SiC crystallinity and promoted the generation of stacking faults in 3C-SiC. Dense SiC with the grain size of 132 nm was fabricated after a two-step sintering at 1600-1550°C. The Al content in the sintered SiC grain was more than 3 times higher than the reported values. Grain boundary diffusion and lattice diffusion were activated due to the high concentration of Al in the powder.

Keywords: Stacking faults, Mechanical alloying, Raman spectroscopy, Spark plasma sintering, Carbides