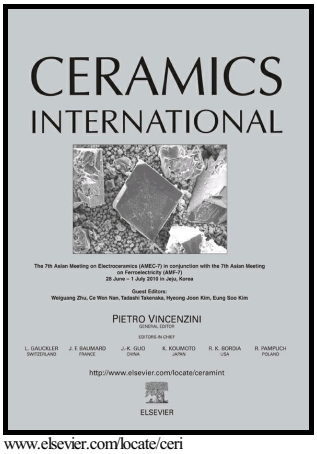

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PII: S0272-8842(18)30586-8
DOI: https://doi.org/10.1016/j.ceramint.2018.03.034
Reference: CERI17671

To appear in: *Ceramics International*

Received date: 16 January 2018
Revised date: 14 February 2018
Accepted date: 5 March 2018

Cite this article as: Anna Kaźmierczak-Bałata and Jacek Mazur, Effect of carbon nanoparticle reinforcement on mechanical and thermal properties of silicon carbide ceramics, *Ceramics International,* https://doi.org/10.1016/j.ceramint.2018.03.034

Effect of carbon nanoparticle reinforcement on mechanical and thermal properties of silicon carbide ceramics

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Abstract

This research presents an analysis of the influence of graphene reinforcement on the thermal and mechanical properties of silicon carbide ceramics, at 2.5 % (wt%.) graphene content. The SiC composites, containing various carbon nanofillers (graphene oxide and graphene nanoparticles), were sintered by the classical two stage spark plasma sintering method. Two current modes were used, the continuous mode and the pulsed current mode. The results from photothermal radiometry and investigations of the mechanical properties showed that graphene additives significantly improve the thermal properties and toughness of material, sintered from a SiC powder. An 45 % growth in the toughness was observed, which increased from 1.21 to 1.75 MPa/$m^{1/2}$. The thermal diffusivity value also increased from 0.60 to 0.71 cm^2/s and giving an improvement in thermal properties of 18 %. The friction coefficient reached 7 % giving an increase in value from 0.62 to 0.66. Microscopic investigations supported the photothermal radiometry (PTR) results. Whilst, thermal imaging revealed homogeneity of the local thermal properties of the products fabricated from the starting SiC powder.

Keywords

SiC composites B, graphene oxide D, spark plasma sintering A, thermal properties C, mechanical properties C

1 Introduction