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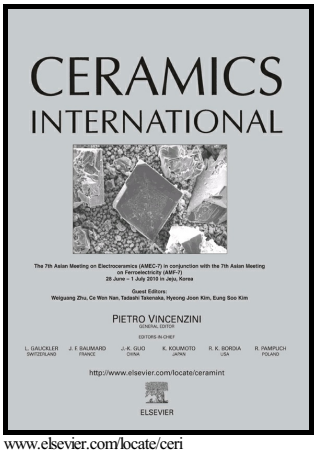

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PII: S0272-8842(17)30213-4
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.02.025
Reference: CERI14641

To appear in: *Ceramics International*

Received date: 15 October 2016
Revised date: 25 January 2017
Accepted date: 6 February 2017

Cite this article as: Yanzhi Cai, Laifei Cheng, Hongfeng Yin, Xiaowei Yin, Yangli Tian, Jinxue Chen and Nan Wang, Preparation and mechanical properties of Ti_3SiC_2/SiC functionally graded materials, *Ceramics International* http://dx.doi.org/10.1016/j.ceramint.2017.02.025

Preparation and mechanical properties of Ti_3SiC_2/SiC functionally graded materials

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Abstract

Ti_3SiC_2/SiC functionally graded materials (FGMs) were prepared via hot-pressing sintering followed by positioning impregnation. Positioning impregnation is a novel technique for local impregnation targeted at graded layers that exhibit poor sintering behaviour. The positioning impregnation process significantly densified layers with SiC volume fractions of more than 70% while only slightly affecting the densities of the other layers and preserving sufficiently weak interfaces between layers. FGMs that were hot pressed at 1600 and 1700 °C and then subjected to impregnation showed not only high flexural strengths but also zigzag load-displacement behaviour. The flexural strengths of these FGMs were 436 and 485 MPa, respectively; in comparison, the values for the FGMs without impregnation that were hot pressed at 1600, 1700 and 1800 °C were 235, 268 and 328 MPa, respectively. Moreover, the fracture toughnesses of these FGMs were 8.23 and 7.15 MPa $m^{1/2}$, respectively; in comparison, the values for the FGMs without impregnation that were hot pressed at 1600, 1700 and 1800 °C were 6.77, 7.05 and 4.65 MPa $m^{1/2}$, respectively.

Keywords: A. Positioning impregnation; B. Composites; B. Interfaces; C. Mechanical properties; D. SiC