Hardness and Fracture Toughness Analysis of ZTA-SWCNT Ceramic Cutting Inserts

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MATERIALS CHARACTERIZATION USING X-RAYS AND RELATED TECHNIQUES
Edited by: Sulaiman, MA; Ahmad, ZA; Mohamed, JJ
Book Series: AIP Conference Proceedings
Volume: 2068
Article Number: UNSP 020005
DOI: 10.1063/1.5089304
Published: 2019
Document Type: Proceedings Paper

Conference

Conference: International Conference on X-Rays and Related Techniques in Research and Industry (ICXRI)
Location: Kota Bharu, MALAYSIA
Date: AUG 18-19, 2018
Sponsor(s): Univ Malaysia Kelantan; X Rays Applicat Soc Malaysia

Abstract

Hardness and fracture toughness of ZTA samples with addition of SWCNT have been investigated. The composition of Al2O3/YSZ was constant at 80: 20 ratios with the amount of SWCNT varied from 0.00, 0.05, 0.10, 0.30 and 0.50 wt %. The SWCNT was soaked in 20 ml ethanol and dispersed using ultrasonic agitation for 1 hour prior to addition with Al2O3/YSZ powder using wet mixing. The hardness and fracture toughness were calculated using Vickers indentation techniques. The Vickers hardness results show that presence SWCNT causes agglomeration in the microstructure of ZTA matrix as a result decreased hardness value. Meanwhile the fracture toughness of ZTA with 0.50 wt. % SWCNT increased to 6.593 MPa.root m which is the highest value. In addition, the good dispersion of CNTs in ZTA matrix composites is with addition 0.10 wt. % of SWCNTs.

Keywords

KeyWords Plus: MECHANICAL-PROPERTIES; CARBON NANOTUBES; ALUMINA; MICROSTRUCTURE

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Funding

Funding Agency	Grant Number
International Islamic University Malaysia (IIUM)	RIGS16-086-0250

View funding text

Publisher

AMER INST PHYSICS, 2 HUNTINGTON QUADRANGLE, STE 1NO1, MELVILLE, NY 11747-4501 USA

Categories / Classification

Research Areas: Materials Science; Physics

Web of Science Categories: Materials Science, Multidisciplinary; Materials Science, Characterization & Testing; Physics, Applied

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1 of 1

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