

## Accepted Manuscript

Title: Escape from the strength-to-toughness paradox: bulk ceramics through dual composite architectures

Authors: Frédéric Monteverde, Cesare Melandri, Simone Failla, Ryan J. Grohsmeyer, Gregory E. Hilmas, William G. Fahrenholtz



PII: S0955-2219(18)30077-3  
DOI: <https://doi.org/10.1016/j.jeurceramsoc.2018.02.003>  
Reference: JECS 11718

To appear in: *Journal of the European Ceramic Society*

Received date: 29-1-2018  
Accepted date: 1-2-2018

Please cite this article as: Monteverde F, Melandri C, Failla S, Grohsmeyer RJ, Hilmas GE, Fahrenholtz WG, Escape from the strength-to-toughness paradox: bulk ceramics through dual composite architectures, *Journal of The European Ceramic Society* (2010), <https://doi.org/10.1016/j.jeurceramsoc.2018.02.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Escape from the strength-to-toughness paradox: bulk ceramics through dual composite architectures

Frédéric Monteverde\*, Cesare Melandri\*, Simone Failla\*, Ryan J. Grohsmeyer<sup>&</sup>, Gregory E. Hilmas<sup>^</sup>, William G. Fahrenholtz<sup>^</sup>

\*National Research Council of Italy, Institute of Science and Technology for Ceramics, Faenza (Italy)

<sup>^</sup>Materials Science and Engineering Department, Missouri University of Science and Technology, Rolla (Missouri, US)

### Abstract

This paper describes an approach to escape from the classic strength-toughness trade-off in bulk ceramics using the dual composite architectural concept. The key questions addressed by the research were: can dual composite architectures be fabricated? -how do dual composite architectures affect the physical properties of ceramics? -do dual composite architectures affect the mechanical behavior of composites? -do dual composite architectures have increased damage tolerance at elevated temperatures? These questions were answered positively. Reinforcing granules dispersed in loose powder mixtures were hot-pressed to obtain fully dense dual composite architectures with target overall composition. Defined sub-composites (labeled granule and matrix) of similar compositions, but differing engineered microstructures, were successfully retained. The brittle-to-ductile transition of MoSi<sub>2</sub> above 1400 K enabled the simultaneous increase in both strength and toughness, and values of up to 440 MPa and 11.5 MPa√m, respectively, were experimentally determined at 1773 K.

Key Words: Dual composite architectures, hot-pressing, microstructure-final, ZrB<sub>2</sub>, strength, fracture toughness

<sup>&</sup>Present address: Corning Incorporated, Painted Post, NY, USA

Download English Version:

<https://daneshyari.com/en/article/7898217>

Download Persian Version:

<https://daneshyari.com/article/7898217>

[Daneshyari.com](https://daneshyari.com)