

# Author's Accepted Manuscript

Mechanical Strength and Damage Tolerance of Highly Porous Alumina Ceramics Produced from Sintered Particle Stabilized Foams

Carolina Tallon, Chayuda Chuanuwatanakul, David E. Dunstan, George V. Franks



www.elsevier.com/locate/ceri

PII: S0272-8842(16)30013-X  
DOI: <http://dx.doi.org/10.1016/j.ceramint.2016.02.069>  
Reference: CER112260

To appear in: *Ceramics International*

Received date: 11 August 2015  
Revised date: 10 February 2016  
Accepted date: 11 February 2016

Cite this article as: Carolina Tallon, Chayuda Chuanuwatanakul, David E Dunstan and George V. Franks, Mechanical Strength and Damage Tolerance of Highly Porous Alumina Ceramics Produced from Sintered Particle Stabilized Foams, *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2016.02.069>

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 galley proof before it is published in its final citable 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.

## Mechanical Strength and Damage Tolerance of Highly Porous Alumina Ceramics Produced from Sintered Particle Stabilized Foams

Carolina Tallon<sup>1,2,3\*</sup>, Chayuda Chuanuwatanakul<sup>1</sup>, David E. Dunstan<sup>1</sup> and George V. Franks<sup>1,2</sup>

<sup>1</sup>*Department of Chemical and Biomolecular Engineering, The University of Melbourne, Victoria 3010, Australia*

<sup>2</sup>*Defence Materials Technology Centre, DMTC, Victoria 3122, Australia*

<sup>3</sup>*Current Address: Department of Materials Science and Engineering, Virginia Tech, Blacksburg, VA 24061, United States*

### Abstract

Highly porous alumina particle stabilized foams were prepared by combining the concepts of particle stabilized foams and gelcasting, using sulfonate surfactants and poly vinyl alcohol (PVA) as the gelcasting polymer. The ceramic samples sintered at 1500°C for 2h had porosities from 65 to 93%, with pore sizes in two categories: “*big pore*” around 300 μm and “*small pore*”, around 100-150 μm, depending on the type and amount of surfactant added. The mechanical behaviour of the foams (axial and diametral compression) depended on the overall porosity and pore size. On average, tensile and compressive strengths around 5 and 16 MPa respectively were measured for samples with bigger pore sizes and larger porosities. Samples with smaller pore sizes and lower porosities produced average values of 12 and 57MPa for tensile and compressive strengths, respectively. The elastic modulus reached a maximum around 3GPa for “*small pore*” size samples. The effect of increasing amount of PVA in the samples had a strong effect on the green mechanical strength, but it did not significantly affect the mechanical response of the sintered alumina foams. Large and complex shape sintered components produced using this route showed a remarkable damage tolerance, due to crack tip blunting.

**Keywords:** Porous Ceramics, Particle Stabilized Foams, Gelcasting, Porosity, Pore size, PVA, Mechanical Strength, Damage Tolerant.

**\*Corresponding author:** Dr. Carolina Tallon, tallon@vt.edu

Download English Version:

<https://daneshyari.com/en/article/10624200>

Download Persian Version:

<https://daneshyari.com/article/10624200>

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