7th INTERNATIONAL WORKSHOP 2013 ON

DYNAMIC BEHAVIOUR OF MATERIALS AND ITS APPLICATIONS IN INDUSTRIAL PROCESSES

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Universidad Carlos III de Madrid

Department of Continuum Mechanics and Structural Analysis

Co-organized by

General

Within the last 7 years, a consortium of Universities and Research Centers including the University Carlos III of Madrid, the National Engineering School of Metz, the Polytechnic University of Poznan and the Institute of Fundamental Technological Research of the Polish Academy of Sciences – Warsaw – has been organizing an annual International Workshop devoted to the dynamic behaviour of materials. The Workshop is conducted with the collaboration of DYMAT Association.

Aims and Scope

The Workshop covers experimental, theoretical and numerical aspects of the mechanical behaviour of solids at high strain rates. The following main topics are intended:

1. Experimental, numerical and theoretical approaches
2. High speed impact and metal forming
3. Dynamic material behaviour and failure
4. Wave propagation phenomena
5. Instabilities and fragmentation processes
6. Other industrial applications

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NUMERICAL CHARACTERIZATION AND ESTIMATION OF ELASTIC PROPERTIES OF CERAMIC FOAMS

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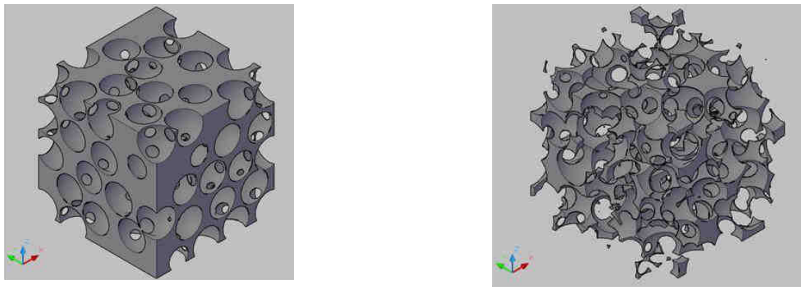
Abstract

Metal/ceramic interpenetrating composites are the materials obtained by liquid metal infiltration into a ceramic foam, which is produced by a chemical method of gelcasting. Porous ceramics fabricated by this method are characterized by a continuous network of spherical cells interconnected by circular windows. The open porosity due to the presence of windows creates good hydro-dynamical properties for liquid metals infiltration. For better understanding of the mechanical behaviour of these composites, a numerical model of a ceramic foam is needed, see e.g. [1].

In this work a numerical model of real foam with different cell sizes is presented and its applications are discussed. Geometric characteristics of real foam samples were estimated from tomographic and scanning electron microscopy images. Using this information, numerical foam model was proposed. The examples of generated numerically structures are shown in Fig. 1. A good agreement between numerical model and the results elaborated from microtomography was obtained.



Porosity 67% Porosity 90%

Fig. 1. Examples of the numerical foam structures with different porosities.

As a result of numerical simulation of compression test of alumina foam for different values of porosity, the Young modulus was estimated.

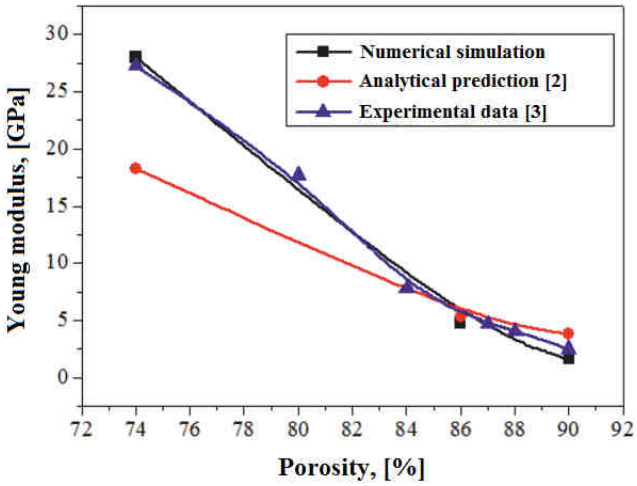


Fig. 2. The comparison of experimental data with numerical and analytical predictions of Young modulus for Al_2O_3 ceramic foams of different porosity.

In Fig. 2 the comparison of experimental data [3] with numerical and analytical predictions [2] of Young modulus for Al_2O_3 ceramic foams of different porosity is presented. It is visible that the analytical estimation shows a good correlation with the results of experiment and simulation for the range of porosity (84%-90%).

Acknowledgment

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