

Accepted Manuscript

Numerical prediction of effective electro-elastic properties of three-dimensional braided piezoelectric ceramic composites

Xiao Ma, Gaofeng Wei

PII: S0263-8223(16)32594-6
DOI: <http://dx.doi.org/10.1016/j.compstruct.2017.07.081>
Reference: COST 8736

To appear in: *Composite Structures*

Received Date: 24 November 2016

Revised Date: 13 June 2017

Accepted Date: 21 July 2017



Please cite this article as: Ma, X., Wei, G., Numerical prediction of effective electro-elastic properties of three-dimensional braided piezoelectric ceramic composites, *Composite Structures* (2017), doi: <http://dx.doi.org/10.1016/j.compstruct.2017.07.081>

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.

Numerical prediction of effective electro-elastic properties of three-dimensional braided piezoelectric ceramic composites

Xiao Ma, Gaofeng Wei*

School of Mechanical and Automotive Engineering, Qilu University of Technology,

Jinan, 250353, P. R. China

* Corresponding author: weigaofeng@126.com

Abstract: In this paper, a novel three-dimensional (3D) braided piezoelectric ceramic composites (BPCC) is developed to improve the mechanical properties of piezoelectric ceramics. Based on the reasonable three-cell model and finite element method, the numerical model of the 3D BPCC in displacement-electric coupling field is established. The effect of fiber volume fraction on the effective electro-elastic coefficients is investigated. The differences in the effective electro-elastic coefficients between the 3D BPCC and continuous straight fiber reinforced piezoelectric ceramic composites (SFPC) are demonstrated. Numerical results show that the 3D BPCC has excellent overall mechanical properties and electrical properties.

Keywords: piezoelectric composites; 3D braided composites; effective electro-elastic properties; displacement-electric coupling field; finite element method

1 Introduction

As an important functional material, piezoelectric ceramics has the advantages of high dielectric coefficients, large piezoelectric effect, high electro-mechanical coupling factor and simple preparation process. It has been widely used in the fields of sensing, driving, vibration control, structural health monitoring, etc [1-3]. However, the ions in piezoelectric ceramics are mainly bound by covalent and ionic bonds, which lead to high brittleness, low toughness and high defect sensitivity, also cause the poor stability and reliability of the smart devices [4-6].

In order to reduce the mechanical defects of piezoelectric ceramics, Bent et al. [7] proposed the piezoelectric fiber composites, the polymer matrix was used to improve

Download English Version:

<https://daneshyari.com/en/article/4917652>

Download Persian Version:

<https://daneshyari.com/article/4917652>

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