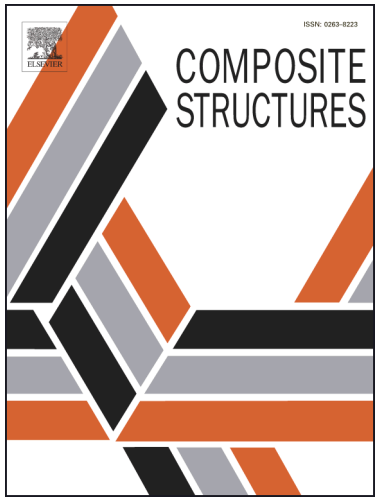
Accepted Manuscript



Numerical evaluation of the effect of pores on effective elastic properties of Carbon/Carbon composites

Xujiang Chao, Lehua Qi, Jing Cheng, Wenlong Tian, Shouyang Zhang, Hejun Li

PII: S0263-8223(17)33661-9
DOI: https://doi.org/10.1016/j.compstruct.2018.05.014
Reference: COST 9653

To appear in: *Composite Structures*

Received Date: 3 November 2017
Revised Date: 27 March 2018
Accepted Date: 2 May 2018

Please cite this article as: Chao, X., Qi, L., Cheng, J., Tian, W., Zhang, S., Li, H., Numerical evaluation of the effect of pores on effective elastic properties of Carbon/Carbon composites, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.05.014

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.

ACCEPTED MANUSCRIPT

Numerical evaluation of the effect of pores on effective elastic properties of Carbon/Carbon composites

Xujiang Chao[a], Lehua Qi[a,*], Jing Cheng[b], Wenlong Tian[a], Shouyang Zhang[b], Hejun Li[b]

a. School of Mechanical Engineering, Northwestern Polytechnical University, Xi'an 710072, PR China.

b. State Key Laboratory of Solidification Processing, Carbon/Carbon Composites Research Center, Northwestern Polytechnical University, Xi'an 710072, PR China

Abstract

Combining with the modified random sequential adsorption algorithms and the microstructure information obtained from substantial PLM images of carbon/carbon (C/C) composites, a strategy is presented for generating the representative volume elements (RVEs) with complex microstructures such as fiber and spatially randomly distributed pores. The formulation of the *Minimum Distance Search Method* for efficiently checking the intersection of the fibers-pores or pores-pores in the RVEs is discussed. Within the frameworks of elasticity, the effect of volume fraction and aspect ratio of pore inclusions on the effective elastic properties of C/C composites are investigated using the finite element method (FEM) and numerical homogenization method. The validation is performed by comparing the predicted effective elastic modulus against those measured by uniaxial tensile tests. FEM results show that with increase of porosity, the effective elastic properties of C/C composites decreased rapidly. Compared with the transverse elastic of unidirectional C/C composites, the downward trend of elastic properties of the felt C/C composites is more inclined. Furthermore, under a certain porosity, with increase of the aspect ratio, the effective elastic properties of C/C composites increase.

Keywords: C/C composites; Pore; Elastic properties; FEM; RVE

*Corresponding author: Prof. Le-hua Qi, Email: qilehua@nwpu.edu.cn;

Download English Version:

https://daneshyari.com/en/article/6703341

Download Persian Version:

https://daneshyari.com/article/6703341

Daneshyari.com