

Accepted Manuscript

Localized stress recoveries in hierarchical aligned porous materials with the influence of surface effects or interphases

Guannan Wang, Quanquan Yang, Bo Yang



PII: S0264-1275(18)30432-5
DOI: doi:[10.1016/j.matdes.2018.05.047](https://doi.org/10.1016/j.matdes.2018.05.047)
Reference: JMADE 3947
To appear in: *Materials & Design*
Received date: 26 February 2018
Revised date: 30 April 2018
Accepted date: 21 May 2018

Please cite this article as: Guannan Wang, Quanquan Yang, Bo Yang , Localized stress recoveries in hierarchical aligned porous materials with the influence of surface effects or interphases. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Jmade*(2017), doi:[10.1016/j.matdes.2018.05.047](https://doi.org/10.1016/j.matdes.2018.05.047)

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.

Localized stress recoveries in hierarchical aligned porous materials with the influence of surface effects or interphases

Guannan Wang^a, Quanquan Yang^{b,*}, Bo Yang^c

^a Center for Advanced Research in the Engineering Sciences, Texas Tech University, Lubbock, TX 79409, USA

^b Jiangsu Province Key Laboratory of Advanced Manufacturing Technology, Huaiyin Institute of Technology, Huai'an 223003, China

^c Department of Civil Engineering, Zhejiang Sci-Tech University, Hangzhou 310018, China

Abstract

In order to study the micromechanical behavior of hierarchical aligned porous structures, an infinite plate with an arbitrarily shaped hole reinforced with a functionally graded hierarchical coating, is investigated. The coating is further composed of aligned porous materials with the considerations of surface effects or interphases/coatings. The solution is derived by following the Muskhelishvili approach at the higher structural level, while the locally exact homogenization theory model is employed to recover the microstructural stress distributions. It can be seen that even though certain magnitudes of stress concentrations already happen at the structural levels (depending on the shape of the hole), the local stress concentrations appear to be much larger. By changing the surface parameters of microstructures, the stress concentrations are varied within certain amounts. Moreover, the magnitudes of local stresses are significantly reduced with the existence of the coatings within the microstructures. Some conclusions are thus summarized: First, the mechanical behavior at higher structural level is not reliable in predicting the possible damages or cracks starting from the microstructures; second, both surface parameters and interphases/coatings in the microstructures play important roles in

* Corresponding author, Tel.: +86-517-8355-9195; Fax.: +86-517-8355-9198; E-mail: qqyang@hyit.edu.cn

Download English Version:

<https://daneshyari.com/en/article/7216862>

Download Persian Version:

<https://daneshyari.com/article/7216862>

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