

Accepted Manuscript

Homogenization of hexagonal and re-entrant hexagonal structures and wave propagation of the sandwich plates with symplectic analysis

Kai Zhang, Zi-Chen Deng, Xiao-Jian Xu, Jun-Miao Meng, Xian-Hong Jiang



PII: S1359-8368(16)32641-5

DOI: [10.1016/j.compositesb.2017.01.048](https://doi.org/10.1016/j.compositesb.2017.01.048)

Reference: JCOMB 4859

To appear in: *Composites Part B*

Received Date: 9 November 2016

Revised Date: 21 December 2016

Accepted Date: 28 January 2017

Please cite this article as: Zhang K, Deng Z-C, Xu X-J, Meng J-M, Jiang X-H, Homogenization of hexagonal and re-entrant hexagonal structures and wave propagation of the sandwich plates with symplectic analysis, *Composites Part B* (2017), doi: 10.1016/j.compositesb.2017.01.048.

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.

1 **Homogenization of hexagonal and re-entrant hexagonal structures**
2 **and wave propagation of the sandwich plates with symplectic**
3 **analysis**

4 Kai Zhang¹, Zi-Chen Deng^{1*}, Xiao-Jian Xu², Jun-Miao Meng², Xian-Hong Jiang¹

5 1. *School of Mechanics, Civil Engineering and Architecture, Northwestern*

6 *Polytechnical University, Xi'an 710072, P. R. China*

7 2. *Key Laboratory for Special Area Highway Engineering of Ministry of Education,*

8 *School of Highway, Chang'an University, Xi'an 710064, P. R. China*

9 **Abstract**

10 The aim of this work is to provide closed-form expressions of the effective elastic
11 constants of hexagonal and re-entrant hexagonal structures, which contain the variable
12 dimensional parameters, such as the relative density, aspect ratio, length ratio and the
13 cell wall angle. We also numerically investigate the dynamic properties of the
14 sandwich plates with hexagonal cores. By taking into account the bending, axial and
15 shearing deformations of the unit cell walls, the effective elastic constants are derived.
16 In order to analyze the wave propagation of the sandwich plates, the original
17 governing equations are converted into a set of the first-order governing differential
18 equations in the Hamilton system, by introducing the dual variables and with the help
19 of a variational principle. The precise integration method in conjunction with the
20 extended Wittrick-Williams algorithm is utilized to numerically solve these equations
21 to obtain the frequencies of structures. The effects of relative density, length ratio, cell
22 wall angle and material distribution parameter on the dispersion relations of
23 hexagonal and re-entrant hexagonal structures are investigated. It is found that the
24 stiffness plays a more dominant role on the dispersion relations than that of the mass,
25 and the effects of length ratio and material distribution parameter are more prominent
26 than that of the cell wall angle.

* Corresponding author, E-mail: dweifan@nwpu.edu.cn (Zi-Chen Deng)
kzhang@nwpu.edu.cn (Kai Zhang)

Download English Version:

<https://daneshyari.com/en/article/5021377>

Download Persian Version:

<https://daneshyari.com/article/5021377>

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