Accepted Manuscript

Dynamic response of sandwich structures with graded auxetic honeycomb cores under blast loading

Xiaochao Jin, Zhihua Wang, Jianguo Ning, Gesheng Xiao, Erqiang Liu, Xuefeng Shu

PII: S1359-8368(16)31964-3

DOI: 10.1016/j.compositesb.2016.09.037

Reference: JCOMB 4529

To appear in: *Composites Part B*

Received Date: 28 January 2016

Revised Date: 4 September 2016

Accepted Date: 13 September 2016

Please cite this article as: Jin X, Wang Z, Ning J, Xiao G, Liu E, Shu X, Dynamic response of sandwich structures with graded auxetic honeycomb cores under blast loading, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.09.037.

Dynamic response of sandwich structures with graded auxetic honeycomb cores under blast loading

Xiaochao Jin [a,b], Zhihua Wang [b], Jianguo Ning [c], Gesheng Xiao [b], Erqiang Liu[b], Xuefeng Shu [b,*]

a State Key Laboratory for Strength and Vibration of Mechanical Structures, School of Aerospace Engineering, Xi'an Jiaotong University, Xi'an 710049, China

b Institute of Applied Mechanics and Biomedical Engineering, Taiyuan University of Technology, Taiyuan, Shanxi 030024, China

c State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing 100081, China

Abstract: An innovative sandwich structure with auxetic re-entrant cell honeycomb cores was proposed in this paper, and the dynamic responses and blast resistance of the honeycomb sandwich structures under blast loading were investigated numerically by employing the LS-DYNA. The honeycomb structures with thicker walls have a higher plateau force and specific energy absorption (SEA) under the compression loading. Deformation modes and deflections distribution along the axis direction caused by plastic stretching and bending were investigated in detail to have a better understanding of the deformation mechanism. Results show that the sandwich structures has a higher ability of resisting deformation along the longitudinal(Y)-direction than the transverse(X)-direction. In addition, the dynamic responses of honeycomb sandwich structures with different stand-off distances, graded cores and arranged orientations were studied. Results show that both the graded honeycomb cores and cross-arranged honeycomb cores can significantly improve the resistance ability of the sandwich structures under blast loading, compared with the ungraded honeycomb cores and regular-arranged cores. Comprehensively, the cross-arranged graded honeycomb cores with higher density of the upper layer performs the best under the blast loading compared with the other configurations, taking the effects of graded cores and arranged orientations into consideration. This

* Corresponding author. Tel./fax: +86 351 6014455.
E-mail address: shuxuefeng@tyut.edu.cn (Xuefeng Shu).