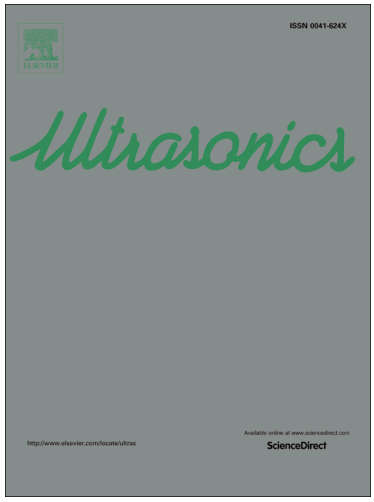

Wave Propagation and Absorption of Sandwich Beams Containing Interior Dissipative Multi-resonators

H. Chen, X.P. Li, Y.Y. Chen, G.L. Huang

PII: S0041-624X(16)30413-9
DOI: http://dx.doi.org/10.1016/j.ultras.2016.12.014
Reference: ULTRAS 5443

To appear in: *Ultrasonics*

Received Date: 7 July 2016
Revised Date: 19 December 2016
Accepted Date: 22 December 2016

Please cite this article as: H. Chen, X.P. Li, Y.Y. Chen, G.L. Huang, Wave Propagation and Absorption of Sandwich Beams Containing Interior Dissipative Multi-resonators, *Ultrasonics* (2016), doi: http://dx.doi.org/10.1016/j.ultras.2016.12.014

Wave Propagation and Absorption of Sandwich Beams Containing Interior Dissipative Multi-resonators

H. Chen, X.P. Li, Y.Y. Chen [a] and G.L. Huang [b]

Department of Mechanical and Aerospace Engineering, University of Missouri, Columbia, MO 65211, USA

ABSTRACT

In this study, a sandwich beam with periodic multiple dissipative resonators in the sandwich core material is investigated for broadband wave mitigation and/or absorption. An analytical approach based on the transfer matrix method and Bloch theorem is developed for both infinite and finite sandwich structures. Wave attenuation constants are theoretically obtained to examine the effects of various system parameters on the position, width and wave attenuation performance of the band gaps. The wave absorption coefficient of the sandwich beam is quantitatively studied to distinguish wave attenuation mechanisms caused by reflection and absorption. It is numerically demonstrated that a transient blast-induced elastic wave with broadband frequencies can be almost completely mitigated or absorbed at a subwavelength scale. The results of this study could be used for developing new multifunctional composite materials to suppress impact-induced or blast-induced elastic waves which may cause severe local damage to engineering structures.

Keywords: Broadband wave mitigation, Dissipative metamaterials, Sandwich beam, Impact load

[a] Electronic mail: yc896@mail.missouri.edu
[b] Electronic mail: huangg@missouri.edu