

## Accepted Manuscript

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PII: S2352-4316(16)30222-X

DOI: <http://dx.doi.org/10.1016/j.eml.2016.11.007>

Reference: EML 239

To appear in: *Extreme Mechanics Letters*

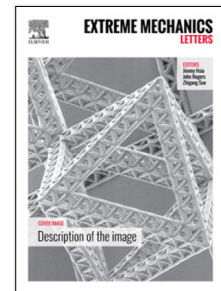
Received date: 17 October 2016

Revised date: 12 November 2016

Accepted date: 13 November 2016

Please cite this article as: Y. Liu, Z. Chang, X.-Q. Feng, Stable elastic wave band-gaps of phononic crystals with hyperelastic transformation materials, *Extreme Mechanics Letters* (2016), <http://dx.doi.org/10.1016/j.eml.2016.11.007>

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# Stable Elastic Wave Band-Gaps of Phononic Crystals with Hyperelastic Transformation Materials

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## ABSTRACT

The elastic wave band structure in a phononic crystal (PC) is usually affected by the deformations in its soft constituent phase. In this work, hyperelastic transformation materials are proposed in the design of PCs in order to achieve stable elastic band-gaps that do not vary with deformation. It is demonstrated that one-dimensional PCs with a semi-linear soft phase can keep all elastic wave modes unchanged with respect to external deformations. However, only S-wave modes can be precisely retained in the PCs made of a neo-Hookean soft material. The theoretical results and the robustness of the proposed PCs are validated by numerical simulations.

**Keywords:** Phononic crystals; Wave; Hyperelasticity; Transformation; Band-gap

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