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POST-BUCKLING DEFORMATION AND BANDGAPS IN SOFT PHONONIC CRYSTALS INLAYED WITH INCLUSIONS

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Phononic crystals (PCs) have been a common hot topic in different disciplines including physics, mechanics, materials, devices, etc. for almost 30 years. The particular band structures in PCs make them perfect candidates for many novel and useful acoustic devices.

In this paper, two-dimensional soft porous periodic structures inlayed with hard inclusions are considered. We here emply the finite element method to study the effects of those rigid inclusions on the buckling modes, the post-buckling deformations, and the band structures in the soft PCs undergoing large deformation.

It is found that both the number and the distributive pattern of the inclusions play a significant role in affecting the bandgap characteristics. A new approach to tuning the bandgaps is thus proposed by adjusting the filling pattern of the inclusions along with dramatically deforming the structures. Compared with the soft PCs without inclusions, the sensitivity of the post-buckling deformation to the initial geometric imperfections is also significantly reduced for the soft PCs with inclusions. Therefore, the post-buckling deformation could develop robustly, and the bandgaps can be tuned in a versatile and reversible way.

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