Design and optimization of acoustic metamaterials with efficient algorithms

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Abstract

Acoustic metamaterials (AMs) gain unusual physical properties from resonance through the engineered structures (instead of chemical composition) in a scale close to or smaller than wavelength of incident waves. AMs comprise intricately-devised periodic unit-cells with different base materials and phases, which can be highly sensitive to the resonance and desired effective properties. In this paper, different design and optimization algorithms of AMs are developed in order to achieve desirable mechanical properties in different engineering areas that include control of noise and vibration in vehicle and mitigation of impact wave. The new computational algorithms developed in this work are very effective to manipulate/control the propagation of stress wave.

Keywords: Acoustic Metamaterials; Noise and Vibration; Impact Wave; Band gap

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