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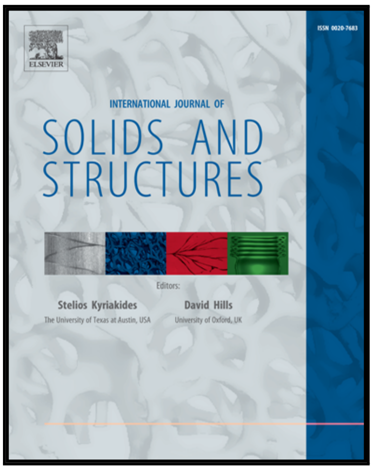

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A numerical simulation capability for electroelastic wave propagation in dielectric elastomer composites: Application to tunable soft phononic crystals

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Abstract

Phononic crystals are periodic, composite solids that exhibit phononic band gaps – frequency ranges in which elastic waves are prohibited. For phononic crystals made from soft elastomers, phononic band gaps may be reversibly manipulated through large elastic deformation of the periodic structure. By using dielectric elastomers, which undergo large, reversible deformations when subjected to an applied electric field, the frequency ranges of band gaps may be adjusted, or new band gaps may be created, through electrical stimuli. In this work, we present our finite-element-based numerical simulation capability for designing electrically-tunable, soft phononic crystals. Our finite-element tools address both nonlinear quasi-electrostatic processes and the linearized dynamics of electroelastic wave propagation

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