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Modeling and simulation of wave scattering of multiple inhomogeneities in composite media

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Abstract

This article presents an analytical-numerical method for the multiple scattering problem of elastic composite media with interacting inhomogeneities under time-harmonic antiplane elastic incident waves. The main focus is on the detailed evaluation of the effectiveness and accuracy of the method in the determination of the local dynamic behaviour of such composite media with significant numbers of inhomogeneities. The method is based on the eigenfunction expansion (Fourier expansion) of single inhomogeneity problem and the use of a pseudo-incident wave technique, which allows the accurate determination of local stress field caused by the interaction. The accuracy and effectiveness of the method for dealing with multiple interaction problems are discussed in detail. Illustrative examples under different loading and geometric conditions are considered to study the local dynamic field, the effective properties of the composite media based on self-consistent material modelling, and the behaviour of stop-band of wave propagating for periodic inhomogeneity arrangements.

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