

Einladung zum Gastvortrag Aachener Mechanik & Statik Kolloquium

23. April 2018 | 15:00 – 16:00 Uhr

Institut für Allgemeine Mechanik
Templergraben 64; 1. OG, Seminarraum 112;
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Professor Igor Andrianov

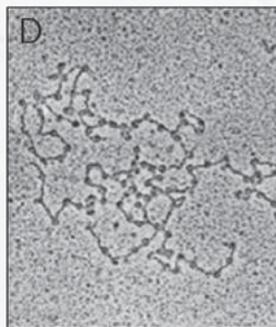
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„COMPOSITE DYNAMIC MODELS FOR PERIODICALLY HETEROGENEOUS STRUCTURES“

Propagation of elastic waves in periodically heterogeneous structures is studied. As illustrative examples, a simple monatomic lattice and a piecewise continuous string are considered. Using the Floquet-Bloch approach, asymptotic expansions of the dispersion curves in the vicinity of band gaps are obtained. Matching these expansions by two-point Pade approximants we derive a “composite” macroscopic equation of motion, which is valid in the entire frequency range for the both short and long-wave cases. The developed model includes three dispersive terms and may be considered as a generalisation of double-dispersive equations that are well known in micropolar theories. It should be emphasised that unlike many phenomenological approaches, the proposed method allows one to determine coefficients of the macroscopic equation on a rigorous theoretical basis incorporating information about the internal structure of the medium and its properties.

Using the two-scale asymptotic procedure, we show that the obtained composite model can describe asymptotically propagation of different types of modes, namely, locally periodic and locally anti-periodic ones.

The developed model provides not only a precise approximation of the dispersion curves, but is also applicable for the solution of dynamic boundary value problems. As an illustrative example, we study a dynamic response of a semi-infinite heterogeneous structure to a pulse load. The analytical solution is evaluated with the help of Laplace transform. The obtained results demonstrate a very good accuracy comparing with the data of a direct numerical simulation.



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