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Plane Harmonic Waves in a Microperiodic Layered Thermoelastic Solid Revisited

Józef Ignaczak

Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland

Modeling of plane harmonic waves in a microperiodic layered infinite thermoelastic solid via an eight-order in time partial differential equation involving a high intrinsic mechanical frequency Ω_M and a high intrinsic thermal frequency Ω_T was proposed by the present author before [see J. Ignaczak, Proceedings TS2003, TS2003, June 8–11, 2003, Blacksburg, VA, U.S.A.]. It was shown there that there are two harmonic waves of a given frequency ω propagating in a positive direction normal to the layering when $\Omega_M \to \infty$ and $\Omega_T < \infty$, or $\Omega_M < \infty$ and $\Omega_T \to \infty$. In the present paper the existence of two dispersive and attenuated harmonic waves of a given frequency ω is proved when $\Omega_M < \infty$ and $\Omega_T < \infty$. Also, a closed-form of the associated velocities and attenuation coefficients is obtained. Numerical results illustrating the two waves for a particular composition of the microperiodic layered thermoelastic solid are included.

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