WAVE PROPAGATION WITH TWO DELAY TIMES IN AN ISOTROPIC POROUS MICROPOLAR THERMOELASTIC MATERIAL

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ABSTRACT

In this paper, we are folowing the plane time-harmonic waves propagation in an entire linear thermoelastic space, knowing the wavelength. Concerning the thermodynamic response, we fit the dual phase-lag model, while the effect of porosity on elasticity is given by Cowin-Nunziano theory.

We obtain two shear waves and five longitudinal waves as: quasi-elastic wave, quasi-microrotational wave quasi-micropolar wave, quasi thermal mode, quasi-phase-lag thermal mode. The purpose of numerical simulations and of graphs is to identify the influence of connection between thermoelasticity, microrotation and porousity. the physical features of thermomechanical bodies are investigated in short time intervals.

With the help of the Mathematica software, we managed to obtain some graphs, in the cases: uncoupled, poroelastic with microrotations, thermoelastic with microrotations and full coupled with microrotations, which highlight the changes of the mentioned waves following the couplings. In the last mentioned case it was observed that all waves are subject to damping in time.

The emphasis is on the transmission of thermal energy, the evolution from a single relaxation time to dual phase-lag model (DPL) being obviously necessary. So, τ_q and τ_θ are introduced as two delay times of the analyzed model, more precisely they represent characteristics that involve the achievement of thermal equilibrium, as well as the existence of collisions between electrons and photons.

Keywords dual phase-lag model · wave · isotropic · porous · micropolar · thermoelastic

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