

Advances in Generalized Thermoelasticity Theory

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Perspective

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COMMENTARY

The thermo elasticity theory may be a combination of elasticity and warmth conduction theories. It's associated with the impact of warmth on the deformation of an elastic medium and therefore the inverse impact of the deformation on the thermal condition of the considered medium. Thermal stress is produced when the time rate of variation of a heat source during a medium or the time rate of variation of thermal boundary conditions on a medium is compared with the structural oscillation characteristics. During this condition, the solutions to the matter for the areas of temperature and stresses should be derived via the thermo elasticity coupled equations. This could be said that the classical theory is an uncoupled theory of thermo elasticity presenting a phenomenon not presenting real physical features of the medium. In classical theory, the thermal equation features a parabolic form, projecting infinite velocities of warmth wave propagation. Such estimation cannot present a true property, especially in problems concerned with thermal shocks [1,2]. Within the last 10 years, several non-classical theories are presented to eliminate these problems. Such theories present the modified sort of the classical Fourier's law of warmth conduction then include the hyperbolic sort of heat transfer equations considering finite velocity for thermal pulses. Supported these theories, thermal propagation acts as a wave phenomenon (not a diffusion phenomenon). Hyperbolic form means finite velocities of warmth distributions (called second sound) presented first by Maxwell (1867). The second effect admits finite speeds for thermoelastic wave propagation especially for the case of thermal shocks in contrast to the results of Fourier's law that waves reach to the top of the body with none delay (an unreal response). A wave-form thermal equation was presented by Lord and Shulman (1967). They considered a replacement law of warmth conduction rather than the law of Fourier. The authors defined the term time constant. Supported their theory, the linear correlation between temperature and warmth flux includes temperature rate and thermal rates. Many researchers have presented useful information about the physical aspects of the relief time for various mediums [3,4]. The second generalized theory was presented by Green and Lindsay (1972), who considered the temperature rate as a reliant term to 2 variables of the relief times. The authors defined two disparate lag times (t_1 , t_2) within the entropy expression and stress correlation. As compared to the classical theory, in Green-Lindsay theory (GL), both equations of energy and motion are more general. In contrast, in LS, the motion equation is that the same as presented by the classical model (just the equation of energy was altered). Therefore, GL modifies the constitutive laws and LS modifies the equation of energy. A replacement model without considering the energy wastage was presented by Green and Naghdi (1993), who employed the displacement-temperature-flux rate in Fourier's law. Compared with the classical model associated with heat conduction Fourier's law, the most aspect of this model is that the thermal stream doesn't consider energy wastage. Within the Green-Naghdi (GN) theory, three different sorts of constitutive response functions were presented. A mix system of equations for GL and LS models was presented by Ignaczak (1981), who also suggested a stress-heat flux uniqueness theorem with single time constant for the generalized thermoelasticity [4]. During this paper, a review of generalized thermoelasticity studies is presented to supply a comprehensive overview of modified thermoelasticity models and their feedbacks in recent studies. The essay consists of Lord-Shulman, Green-Lindsay, Green-Naghdi, dual-phase-lag, and multi-phase-lag theories with their applications for various geometries and materials. Moreover, the considered geometry and solution technique in each research are expressed.

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