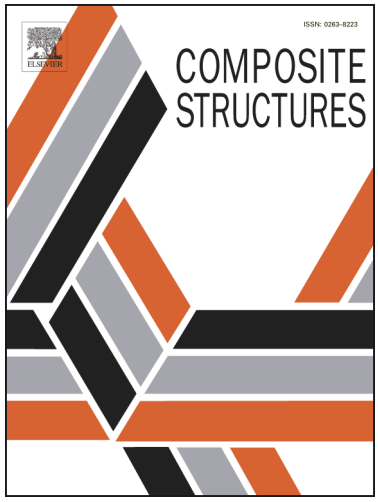

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Liouville-Green Approximation: An Analytical approach to Study the Elastic Waves Vibrations in Composite Structure of Piezo Material

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Abstract

This research article delves the study of surface waves in functionally graded piezoelectric material (FGPM) clubbed between two dissimilar piezomagnetic (PM) media. The transference of elastic waves in a composite structure is analyzed following the elastic wave theory of magneto-electro-elasticity. Liouville-Green's (LG) approximation technique is used to solve the differential equation. The exponential variation is assumed in material gradients of FGPM stratum. It is noticed that the frequency of considered wave depends significantly on the material gradient coefficients, which may be a crucial factor to regulate the dispersion characteristics of functionally graded material (FGM) waveguides. Frequency equations have been obtained for electrically open and short cases in determinant form. The profound effect of parameters like material gradients (piezoelectric, dielectric and elastic) and width of the layers, on the phase velocity of Love type wave are presented graphically. Moreover, it is noticed that the material gradients also influences the electromechanical coupling factor. This influence has shown through the graph. Different parametric curves are merged into a single figure to increase the readability of the graphs. The magnetic potential function is derived analytically for all three gradient factors of FGPM plate. Obtained results are matched analytically and graphically with the established results.

Keywords: LG approximation, Mechanical Surface Waves, FGPM, PM, Coupled electromechanical factor.

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