Reflection of plane waves at the boundary of Piezothermoelastic Half-space with Impedance

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1. INTRODUCTION & OBJECTIVE

The Impedance Boundary Condition is a model boundary applicable in wave dynamics when the electromagnetic field penetrates only slightly beyond the boundary. The present article analyzes the scattering of plane wave at the boundary of piezothermoelastic half space with impedance boundary conditions. The interaction of mechanical waves with various media is a growing field of study, particularly relevant for optimizing smart materials used in devices like sensors, actuators, and transducers. Specifically, the study investigates the impact of the impedance parameter on amplitudes of different reflected waves. Using suitable constitutive equations and boundary conditions, secular equations for the system are obtained. Then amplitude ratios are plotted for a known piezothermoelastic material.

The objective is to study the impact of impedance on the wave dynamics of a quasi-Plane wave. The research plots the amplitude ratios as a function of the angle of incidence for classical theory of thermodynamics. The analytical approach gives an estimate for the value of impedance parameter and angle of incidence required to achieve a desired energy distribution among the reflected waves.

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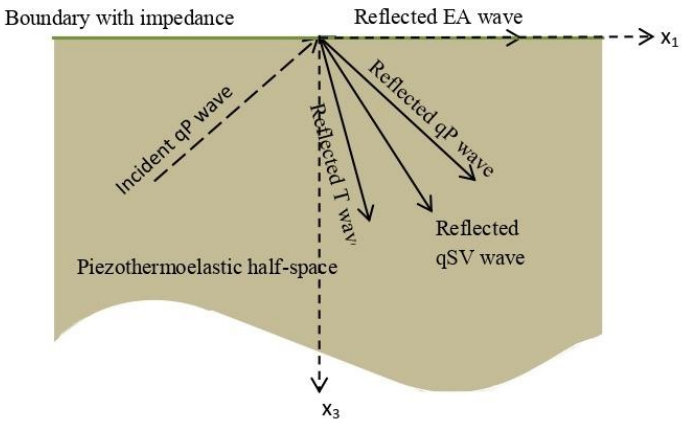
2. RESULTS & HIGHLIGHTS OF IMPORTANT POINTS



Scattering of plane wave(as above) produces four reflected waves. These waves are reflected at different angles for different incident angles. Each of these has certain amplitude and energy ratio as compared to the incident wave that is studied in the article. Classical theory of thermoelasticity, given by Biot(1956) is used in the formulation. With the help of amplitude ratio curves, a numeric value of impedance parameter is proposed for the desired outcome. Incidence angle of the wave also plays a crucial role in energy distribution of the reflected waves.

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