LAMB TYPE WAVES IN PIEZOMAGNETICS MEDIA

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In this paper we considered the elastic SH waves coupled with electromagnetic wave of TM polarization in a layer with piezomagnetic properties of the orthorhombic 222, mm2.

Wave dispersion equations are obtained. Demonstrated the existence of similar modes symmetric and antisymmetric Lamb modes in magnetoelastic plate:

\[
\frac{\tan \chi_h}{\tan \chi_k} = \frac{\rho}{k^2} \left( \frac{\Delta_1 b_{21}}{\Delta_2 b_{43}} + \chi \frac{\Delta_2 b_{43}}{\Delta_1 b_{21}} \right)
\]

Where \( l \) - thickness of plate. Boundaries of layer metallised. \( k, \chi \) are components of elastic and electromagnetic wave vectors along Z axis. By using matricant method for piezomagnetic media for (1-2):

\[
\Delta_i = b_{ii} b_{33}^2 + i \omega \mu_{ii} \frac{n^2 Q_{36}^2}{\omega \mu_{33}} b_{33}^2; \quad b_{ij} = -\rho \omega^2 + n^2 c_{ij}^2 + \frac{n^2 Q_{36}^2}{\mu_{33}^2};
\]

The cases of the metallized surfaces and the free (vacuum) surfaces of layer are considered. The interaction between elastic and electromagnetic waves in piezomagnetic is considered on a joint equation set of motion of elastic media and the Maxwell’s equations for electromagnetic field.

\[
\begin{aligned}
\frac{\partial \sigma_{ij}}{\partial x_j} &= \rho \frac{\partial^2 u_i}{\partial t^2} + \text{rot} \vec{E} = -\frac{\partial \vec{B}}{\partial t}; \quad \text{rot} \vec{H} = \frac{\partial \vec{D}}{\partial t} \\
\{ \sigma_{ij} &= c_{ijkl} \varepsilon_{kl} - Q_{ijkl} H_k \\
B_j &= \mu_{ij} H_j + Q_{ijk} \varepsilon_{jk} \\
D_i = \varepsilon_{ij} E_i, B_j &= \mu_{ij} H_i, \varepsilon_{ij} = \frac{1}{2} \left( \frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial x_i} \right) \}
\end{aligned}
\]

Attention is focused on the analysis of situations where the modes of plane wave conversion derived on the basis of the electromagnetic theory differ significantly from the calculated within the frame of the quasi-electrostatic approximation.