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Love-type waves in layered systems consisting of two cubic piezoelectric crystals

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In memory of Prof. Dr. Galina Georgievna Kessenikh

Abstract

Dispersion relations of the seven partial Love-type waves (LTW7) have been found numerically for two-layer systems consisting of the class-23 cubic piezoelectric media $Bi_{12}SiO_{20}$ and $Bi_{12}GeO_{20}$, for two cases: a layer of $Bi_{12}SiO_{20}$ on a substrate of $Bi_{12}GeO_{20}$, and the reverse configuration. A few modes of LTW7 waves are shown, the first of which begins at a threshold value of $kh^{th} \sim 5.3$. The values of kh^{th} for the classical Love waves are tabulated for comparison with the LTW7 waves. "Dispersive solutions" have also been found, whose phase speeds are higher than the bulk shear wave speeds in either medium.

1. Introduction

Layered structures with inhomogeneous boundary conditions, for example, a thin film on a substrate, are currently of interest. The important thing is to know phase velocities and dispersion relations, for applications in filters and acoustic delay lines. In 1911, Love [1] analyzed a layered system consisting of an isotropic thin film on an isotropic substrate, solid-coupled at their interface. He concluded that shear surface waves localized in the thin film and decaying in the substrate can exist if the velocity of the bulk shear wave in the thin film is less than that in the substrate. These shear surface waves are now known as the Love waves; their polarization is

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