

# Stoneley wave propagation in an orthotropic thermoelastic media with fractional order theory

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**Abstract.** The present paper deals with the study of Stoneley wave propagation at the interface of two dissimilar homogeneous orthotropic thermoelastic solids with three phase lags in the context of fractional order theory of thermoelasticity. By using appropriate boundary conditions the secular equations of Stoneley waves are derived in the form of the determinant. The wave characteristics like phase velocity, attenuation coefficient are computed numerically. The numerical simulated results have shown with the help of graphs to show the effect of fractional parameter on the phase velocity, attenuation coefficient, displacement components, stress components and temperature change.

**Keywords:** orthotropic medium; fractional order; Stoneley wave propagation; phase velocity; attenuation coefficient; phase lags

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## 1. Introduction

During the last few decades, the study of surface waves propagating in different media along the interface of two dissimilar half spaces in perfect contact is one of the interested and important areas of research in the scientific community. These elastic waves propagate through earth's surface have variable properties when they travel through different interfaces or mediums. These waves not only give us the information about the internal structure of the earth but also helpful in the study of materials like minerals, crystals and metals, etc. The interface waves require at least one of the two mediums is solid while the other may be a vacuum, air, a liquid or solid. However, the boundary or interface wave which occurs at the interface of two solid mediums is known as Stoneley wave. The penetration depth of these waves is similar as that of Rayleigh wave and are highly dispersive in nature. Stoneley waves are well known in the study of geophysics, ocean acoustics and non-destructive evaluation, etc.

The wave that can propagate along a fluid-solid interface is referred to as Scholte wave. Stoneley waves have high intensity at the boundary and decreases exponentially far away from it. Sonic tool generates a wave in a borehole is an example of Stoneley wave. The dispersion equation for the propagation of Stoneley waves was derived by Stoneley (1994). Tajuddin (1995) investigated the existence of Stoneley waves at an interface between two micropolar elastic spaces. Moreover, the

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