PhD Dissertation Defense Announcement
Mechanical and Aerospace Engineering Department
University of Texas at Arlington

Stress Analysis of Anisotropic Inclusion Problems Using Complex Variables

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Abstract

This work introduces an analytical method to analyze stress in composite materials, focusing on a system where a circular anisotropic inclusion is embedded within an infinitely extended isotropic matrix subjected to uniform far-field stresses. The method utilizes symbolic software to handle complex calculations, employing Airy stress functions for the isotropic matrix and Lekhnitskii's formulation for the anisotropic inclusion. The stress distribution in the matrix is represented using a Laurent series, while a Taylor series is used for the inclusion. Unknown coefficients in these series are determined by enforcing continuity of displacements and tractions at the matrix-inclusion interface and satisfying far-field boundary conditions. The approach yields novel closed-form solutions, extended previous analytical methods from isotropic to anisotropic inclusion problems, and offers potential applications in areas such as thermal stress analysis and heat conduction.