Correspondence Relations for Fracture Parameters of Interface Corners in Anisotropic Viscoelastic Materials

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Abstract: The problems of the interface corners between two dissimilar anisotropic viscoelastic materials are studied in this paper. Through the use of the well-known correspondence principle between linear elasticity and linear viscoelasticity, fracture parameters in the Laplace domain can be obtained from the path-independent H-integral for the corresponding problems of anisotropic linear elastic materials. Further application of the correspondence relations for fracture parameters proposed in our recent study then leads us the solutions of fracture parameters in the time domain. To show the applicability and accuracy of the proposed method, several different kinds of numerical examples are presented such as a centered interface crack, free edges between two dissimilar materials, and the interface corners appeared within the electronic packages. The fracture parameters calculated in this study include the orders of stress singularity and the stress intensity factors of opening mode, shearing mode and tearing mode. The proposed method allows the orders of stress singularity be real or complex, repeated or distinct, and the fracture mode be pure mode or mixed mode.

Keywords: Correspondence principle, path-independent H-integral, interface corners, stress singularity, stress intensity factors.

1 Introduction

In engineering applications, most of polymeric materials are treated as viscoelastic materials which exhibit a time and rate dependence. To promote the development of new materials for modern industries, considerable attention has been devoted to the investigation of the materials which possess anisotropic viscoelastic properties [Volkov (2005); Selovanov (2010)]. To deal with the two-dimensional problems of anisotropic viscoelasticity and piezoelectricity, a special boundary element for

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