A Dynamic Contact Problem between Viscoelastic Piezoelectric Bodies with Friction and Damage

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Abstract: We consider a dynamic contact problem between two thermo-electro-viscoelastic bodies with damage and an internal state variable. The contact is bilateral and is modeled by Tresca's friction law. The damage of the materials is caused by elastic deformations. We derive a variational formulation for the model which is in the form of a system involving the displacement field, the electric potential, the internal state variable field, the temperature and the damage. Then we proved the existence of a unique weak solution to the model.

Keywords: *viscoelastic piezoelectric materials; internal state variable; damage; temperature; friction contact.*

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1 Introduction

Our research paper tackles a frictional bilateral contact problem including the topic of piezoelectric, which can be explained as follows: when we apply mechanical pressure to some types of crystalline materials such as ceramics $BaTiO_3, BiFeO3$, a voltage proportional to the pressure is produced. Meanwhile, changes in shape and dimension occur if an electric field is applied to some types of crystalline materials. At present, there is a great interest in the study of piezoelectric materials for their importance in radio-electronics, electroacoustics and instrumentation. Thus, a big interest in the contact problems occurs because of the fact that parts of the equipment are in contact. So, many models have been developed to explain the interaction between the electrical and mechanical fields, see for example [2, 8] and the references therein. Frictional contact problem is a static problem of electro-elastic materials mentioned in [3] and [10], considering that the basis is

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