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A Dynamic Contact Problem for Piezo-Thermo-Elastic-Viscoplastic Materials with Damage

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Abstract: We consider a dynamic contact problem between a piezo-thermo-elastic-viscoplastic material with damage and a rigid obstacle. The contact is frictional and bilateral, the friction is modeled by Coulomb's law with heat exchange. We employ the electro-elastic-viscoplastic with damage constitutive law for the material. The evolution of the damage is described by an inclusion of parabolic type. We establish a variational formulation for the model and we prove the existence of a unique weak solution to the problem. The proof is based on a classical existence and uniqueness result on parabolic inequalities, differential equations and a fixed point argument.

Keywords: *viscoplastic; piezoelectric; temperature; damage; variational inequality; fixed point.*

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1 Introduction

Because of its considerable impact in everyday life and its multiple open problems, contact mechanics still remains a rich and fascinating domain of challenge. The literature devoted to various aspects of the subject is considerable, it concerns the modelling, the mathematical analysis as well as the numerical approximation of the related problems. For example, many food materials used in process engineering are elastic-viscoplastic [14] and consequently, mathematical models can be very helpful in understanding various problems related to the product development, packing, transport, shelf life testing, thermal effects, and heat transfer. It is thus important to study mathematical models that

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