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Frictional Contact Problem for Thermoviscoelastic Materials with Internal State Variable and Wear

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Abstract: In this paper, we study a contact problem between a deformable viscoelastic body and a rigid foundation. Thermal effects, wear and friction between surfaces are taken into account. We model the material's behavior by a nonlinear thermo-viscoelastic law with the internal state variable. The problem is formulated as a coupled system of an elliptic variational inequality for the displacement and the heat equation for the temperature. Our proof is based on nonlinear evolution equations with monotone operators, differential equations and fixed point arguments.

Keywords: *thermo-viscoelastic materials; internal state variable; variational inequality of evolution; fixed point; wear.*

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1 Introduction

During the last decades, the analysis of mathematical models in Contact Mechanics is rapidly growing. These models are suggested for different materials using different boundary conditions modelling friction, lubrication, adhesion, wear, damage, etc.

The aim of this paper is to model and establish the variational analysis of a contact problem for viscoelastic materials within the infinitesimal strain theory. The process is supposed to be subject to thermal effects, friction and wear of contacting surfaces. Mathematical models in Contact Mechanics can be found in [3, 4, 9, 11, 13].

Wear of surfaces is the degradation phenomenon of the superficial layer caused by many factors such as pressure, lubrication, friction and corrosion. Moreover, wear is a

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