Nonlinear Dynamics and Systems Theory, **24** (1) (2024) 80–98

Thermo-Electroelastic Contact Problem with Temperature Dependent Friction Law

A. Oultou [1], O. Baiz [2*] and H. Benaissa [1]

[1] *Sultan Moulay Slimane University, FP of Khouribga.*
[2] *Ibnou Zohr University, FP of Ouarzazate.*

Received: August 12, 2023; Revised: January 28, 2023

Abstract: In this work, we consider a dynamical unilateral contact problem with Coulomb's friction and thermo-electroelastic effects. We focus here on the dynamical effects such as frictional heating and thermal softening at the contact interface. The thermo-electro-elastic constitutive law is assumed to be linear and the foundation is thermally and electrically conductive. We derive a variational formulation of the problem and establish the existence of a weak solution. The proof is based on a suitable combination of the penalty method, standard arguments of variational equations and fixed point theorem.

Keywords: *thermo-electro-elastic materials; dynamic contact problem; frictional heating; variational analysis.*

Mathematics Subject Classification (2010): 47J20, 49Sxx, 70K20, 74F05, 74F15, 74G30, 74M10, 74M15, 93Axx.

1 Introduction

A piezoelectric material is a substance that generates electrical charges when mechanical pressure is applied and mechanically deforms when an electric field is applied. As a result, the piezoelectric material performs the function of a transducer, converting electrical energy into mechanical energy and vice versa. These so-called smart materials, among other things, are used as switches in radio-logic, electric-acoustic, and measuring devices. Piezoelectric materials have been extensively studied, and one natural extension of these coupled electro-mechanical models is to include temperature as an additional state variable to account for thermal effects as well as piezoelectric effects.

* Corresponding author: mailto:othman.baiz@gmail.com

