

WELL-POSEDNESS AND STABILITY RESULT OF A NONLINEAR DAMPING POROUS-ELASTIC SYSTEM IN THERMOELASTICITY OF SECOND SOUND WITH INFINITE MEMORY AND DISTRIBUTED DELAY TERMS

Zineb Khalili ¹, Djamel Ouchenane ¹ and Abdelbaki Choucha ²

¹Laboratory of pure and applied Mathematics, Amar Teledji Laghouat University,
Algeria

²Department of Mathematics, Faculty of Exact Sciences, University of El Oued, B.P.
789, El Oued 39000, Algeria

Abstract. The propagation of elastic waves in a porous medium with the presence of two different damping terms is a complex phenomenon occurring in many applications, especially when it comes with the distributed delay.

In this paper, we consider a one-dimensional Porous thermoelastic system, with nonlinear damping, infinite memory and distributed delay terms, where the heat conduction is given by Cattaneo's law. We establish the well posedness of the system. And we prove the stability results of the system for the cases of equal and nonequal speeds of wave propagation.

Keywords. Well-Posedness, General Decay, infinite memory, Nonlinear damping, Porous-elastic system, Distributed delay term.

AMS (2010) subject classification: 35L70; 35B40;74D05; 93D20

1 Introduction and preliminaries results

In this work, we are concerned the following system,

$$\begin{cases} \rho_1 u_{tt} - \mu u_{xx} - b\phi_x = 0, \\ \rho_2 \phi_{tt} - \delta \phi_{xx} + bu_x + \xi \phi + \int_0^\infty g(s) \phi_{xx}(t-s) ds + \gamma \theta_x \\ + \mu_1 \phi_t + \int_{\tau_1}^{\tau_2} |\mu_2(\varrho)| \phi_t(x, t - \varrho) d\varrho + \alpha(t) f(\phi_t) = 0, \\ \rho_3 \theta_t + \kappa q + \gamma \phi_{tx} = 0, \\ \rho_4 q_t + dq + \kappa \theta_x = 0, \end{cases} \quad (1)$$

where

$$(x, \varrho, t) \in (0, 1) \times (\tau_1, \tau_2) \times (0, \infty),$$