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EXPONENTIAL STABILITY AND UNIQUENESS IN THERMOELASTICITY WITH TWO TEMPERATURES

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Abstract. In this paper we study the asymptotic behaviour of the solutions of the thermoelasticity with two temperatures. First, we prove the exponential spatial decay. An upper bound for the amplitude term is also obtained. The exponential decay with respect to the time is proved for the one-dimensional case. Last section is devoted to prove uniqueness of solutions when the Lamé constants are not positive.
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1 Introduction

Thermoelasticity with two temperatures is one of the non classical theories of thermomechanics of elastic solids. The main difference of this theory with respect to the classical one is in the thermal dependence. It was proposed in the references [4,6] and several authors have dedicated its attention to this problem (among others, Iesan [8], Chen *et al.* [2,3,15]).

In recent years an intensive study of the spatial estimates has been developed. We may recall several contributions in several thermoelastic theories (see [5,9-11,12,13]). In the case of hyperbolic systems it is possible to prove the vanishing in finite time of the solutions of the transient problem. In the case of a coupled hyperbolic with a parabolic problem it can be proved that the spatial behaviour remains that of the parabolic equations. In this paper we have another kind of coupling. The method proposed in [10-13] to study it can not be used. In fact we can only prove exponential decay. On the other hand, this is not surprising if we remember the comments of Horgan *et al.*[7] concerning the heat equation in the case of a rigid solid.

The exponential stability with respect to time is also studied. We remember that this is a very usual topic in the study of thermoelastic theories. The exponential stability could be proved using the energy method for the one dimensional problem. We propose here a method that has been used in the study of a mixture of elastic solid with a fluid [14].