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STUDY OF THE SOLUTIONS OF THE PROPAGATION OF HEAT IN MIXTURES

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Abstract. The aim of this paper is to study some questions concerning heat propagation in a mixture of isotropic and homogeneous heat conductors. We consider two kinds of problems: dynamic and static. In the dynamic case, we prove existence and uniqueness of solutions for several Cauchy problems. In the static case, we obtain the exact solutions when the domain is a cylinder. Last section is devoted to study an overdetermined problem.
Keywords. Conduction of heat in mixtures, existence, uniqueness, dynamic and static problems, exact solutions, overdetermined problems.
AMS (MOS) subject classification: 35K05, 35J25, 35B05, 80A15.

1 Introduction

The continuum theory of mixtures has been developed in the recent years. An extensive review of the literature on mixtures can be found in the reviews of Bowen [4], Atkin and Craine [2], Bedford and Drumheller [3], Samohyl [18] and Rajagopal and Tao [17]. Some authors have focussed their attention in theories in which the constituents are at different temperatures. Eringen and Ingram [8,14] presented the first thermomechanical theory for mixtures in which the individual constituents were allowed to have different temperatures. Constitutive theories for mixtures whose constituents have different temperatures have been considered by various authors including Dunwoody and Muller [7], Bowen and Garcia [5], Craine, Green and Naghdi [6], Gurtin and De La Penha [10], Sampaio and Williams [19] and Khoroshun and Soltanov [15].

In this paper, we study the problem of heat propagation in a mixture of isotropic and homogeneous heat conductors. In [10] Gurtin and De La Penha established a system of equations that describes the heat flow through a mixture. The field equations are in accord with the equations established in [12]. It is worth recalling that Iesan and Quintanilla have studied some questions concerning this problem [13].