The Initial Value Problem for Combustion Fronts in a Porous Medium
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1 Abstract

The present work is concerned with the initial value problem associated with a nonlinear reaction-diffusion-convection system which models the propagation of a combustion front in a porous medium with two layers. Such a system was proposed in Mota-Schecter [2], where a family of traveling wave solutions was found. In this work all coefficients depending on physical parameters were considered constants. For the particular case, where the fuel concentrations in both layers are known functions, the Cauchy problem was solved in Mota-Santos [1] using an iterative method.

The purpose of this research is to deduce such existence theorems for combustion front through a Hilbert space approach, making use of the semi-groups theory of operators and of the Kato’s theory (Tosio Kato) [3] for the well-posed associated initial value problem. Moreover, we consider a more realistic system in which the coefficients depend on the spatial variable $x$, instead of being constant. We will reduce the initial value problem to a problem of abstract initial value for a differential equation operator in a Hilbert space. After establishing the existence and uniqueness of solutions of this abstract initial value problem, we shall prove their regularity as functions of space-time variables, which will lead us to an existence theorem for the classical solutions.

References

