Classical Solutions to a Combustion Problem in Porous Media with n Layers

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In this talk, we study the classical solutions for a parabolic system of reaction-diffusion-convection equations coupled to a system of ordinary differential equations with initial and boundary conditions in a limited domain. The coupled system models the propagation of a combustion front through a porous medium with layers, where the dependent variables are the temperatures and the fuel concentrations in each layer.

Initially, using the Monotonic Iterative Method, we prove the existence and uniqueness of the global solution over time for the particular case, where the fuel concentrations in each layer are known functions.

Next, we prove the existence of the local solution in time for the complete problem, when the fuel concentrations are unknown functions. The proof is obtained from the fundamental solutions to the parabolic system, where we construct an iterative process that contains a sequence that converges to a local solution of the problem, assuming that the initial data are continuous and limited functions.

Using the maximal solution concept and the Zorn Lemma, we prove that the local solution can be extended to a global solution of the problem.

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