EBED - Escola Brasileira de Equações Diferenciais
UFPB - Universidade Federal do Paraíba
Edição Nº 4 Agosto 2011

TRAVELING WAVES FOR A COMBUSTION MODEL IN POROUS MEDIA.

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In this work, we consider a simplified PDE system modeling combustion of oil with oxygen or air in a porous medium. We prove the existence of traveling wave solutions connecting a completely burned state behind the reaction front to an unburned state ahead of it. Such traveling waves correspond to heteroclinic orbits of an associated ODE system whose alpha limit set is an hyperbolic saddle point and the omega limit set is a nonhyperbolic equilibrium point. They occur for an infinite range of traveling wave speeds above a critical value, which we also characterize. This critical speed corresponds to an heteroclinic orbit, for which the unstable manifold of the saddle coincides with the stable manifold of the nonhyperbolic equilibrium point. Such traveling wave solution associated to the critical speed is known in the literature as a *strong* traveling wave because the orbit tends exponentialy to both equilibria. For other speeds, above the critical value, the unstable manifold of saddle point tends to the nonhyperbolic equilibrium tangent to the center manifold.

Here, we consider de case where the speed of the particles ahead of the combustion front is greater than the fraction of the heat capacity of oil as compared to the total heat capacity. The opposite case was considered in [2]. In contrast with that case, where the strong traveling wave determines a single temperature value behind the front, in our case, it determines two different temperature values. The proofs use geometric singular perturbation theory.

References

[1] J. C. MOTA AND A. J. SOUZA, *Traveling Waves for a Combustion Model in Porous Media*, in Preparation, 2011.

[2] J. C. MOTA, W. DANTAS AND D. MARCHESIN, *Combustion Fronts in Porous Media*, *SIAM J. Appl. Math.*, **62**, 2002.

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