Qualitative properties of weak solution for pseudo-parabolic equation contain viscoelastis terns and associated with homogeneous Robin conditions

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Abstract

In this paper, we consider initial boundary value problem of the generalized pseudo-parabolic equation contain viscoelastic terms and associated with Robin conditions. We establish firstly the local existence of solutions by standard Galerkin method. Then we prove blow-up results for solutions when the initial energy is negative or nonnegative but small enough or positive arbitrary high initial energy respectively. We also establish the lifespan for the equation via finding the upper bound and the lower bound for the blow-up times. For negative energy, we introduce a new method to prove blow-up results with sharper estimate for upper bound for the blow-up times. Finally, we prove both the global existence of the solution and a general decay of the energy functions under some restrictions on the initial data.

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