

Error estimates for two types of Lagrange-Galerkin scheme for the Peterlin viscoelastic model

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Abstract

A dumbbell-based model for dilute polymer solutions is considered. We present two types of a stabilized Lagrange–Galerkin scheme for the so-called Peterlin viscoelastic model. Both schemes consist of the method of characteristics and Brezzi–Pitkäranta’s stabilization method for the conforming linear elements. For the linear semi-implicit scheme the error estimates with the optimal convergence order are proved under a mild stability condition, while for the fully implicit nonlinear scheme the optimal convergence order is proved without any relation between the time increment and the mesh size. Theoretical convergence order is in both cases confirmed by the numerical experiments, see [1,2].

Keywords: viscoelastic, pressure-stabilization, finite elements, characteristics, error estimates, optimal convergence

References

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