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Finite element approximation of viscoelastic fluid flow using characteristics method. (English)

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Summary: It is known that for numerical approximation of Oldroyd's B model for viscoelastic fluid flows some upwinding is needed for the convection of extra-stress tensor. In this paper we make numerical analysis of such an approximation with upwinding by the method of characteristics in a finite element context. The approximate stress, velocity, and pressure are, respectively, P_1 discontinuous, P_2 continuous, and P_1 continuous. We suppose that the continuous problem admits a sufficiently smooth and sufficiently small solution. We show by a fixed point method that the approximate problem has a solution, and give an error bound.

MSC:

76M10 Finite element methods applied to problems in fluid mechanics

76A10 Viscoelastic fluids

Cited in 6 Documents

Keywords:

finite element method; Oldroyd's B model; viscoelastic fluid; extra-stress tensor; upwinding; method of characteristics; fixed point method; error bound

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