Pressure error estimates of a stable linear semi-implicit Euler Finite Element scheme for a penalized nematic liquid crystal model

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A linear fully discrete mixed scheme, using C^0 finite elements in space and a semi-implicit Euler scheme in time, is considered for solving a penalized nematic liquid crystal model (of the *Ginzburg-Landau* type) in $3D$ domains.

This scheme has been introduced in [1], where the authors proved the unconditional stability and convergence towards weak solutions, and first-order optimal error estimates for the velocity for regular solutions.

In this work, we prove first-order optimal error estimates for the pressure for regular solutions, only assuming small enough time step (depending on the data of the problem). In particular, constraints relating time step and mesh size are avoided.

References

[1] Girault V., Guillén-González F. *Mixed formulation, approximation and decoupling algorithm for a penalized nematic liquid crystals model, To appear in Math. Comput.*