


复旦大学数学科学学院
数学综合报告会

报告题目：Optimal rate convergence analysis and error estimate of a finite difference scheme for the Ericksen-Leslie ystem with the penalty function

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报告摘要：

A first order accurate in time, finite difference scheme is proposed and analyzed for the Ericksen-Leslie system, which describes motions of nematic liquid crystals. For the penalty function to approximate the phase field constraint, a convex-concave decomposition for the corresponding energy functional is applied. In addition, appropriate semi-implicit treatments are adopted to the convection terms, for both the velocity vector and orientation vector, as well as the the coupled elastic stress terms. In turn, all the semi-implicit terms could be represented as a linear operator of a vector potential, and its combination with the convex splitting discretization for the penalty function leads to a unique solvability analysis for the proposed numerical scheme. Furthermore, a careful estimate reveals an unconditional energy stability of the numerical system, composed of the kinematic energy and internal elastic energies. More importantly, an optimal rate convergence analysis and error estimate for the numerical scheme, which will be the first such result in the area.

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