FINITE ELEMENT METHODS FOR REDUCED LANDAU-DE GENNES MINIMIZATION PROBLEMS OF NEMATIC LIQUID CRYSTALS AND FERRONEMATIC SYSTEMS

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ABSTRACT

In this talk, we first discuss the finite element approximation of nonlinear elliptic partial differential equations that model the equilibrium configurations of a two-dimensional nematic liquid crystal device. In the second part, we focus on the analysis of a free energy functional, that models a dilute suspension of magnetic nanoparticles in a two-dimensional nematic well, referred as ferronematics. We discuss the asymptotic analysis of global energy minimizers in the limit of vanishing elastic constant, where the re-scaled elastic constant is inversely proportional to the domain area. We establish the existence and local uniqueness of the discrete solutions of the associated Euler-Lagrange PDE, error estimates in the energy and L^2 norms with parameter dependency. The theoretical results are complemented by the numerical experiments on the discrete solution profiles, and the numerical convergence rates that corroborates the theoretical estimates.

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