Lattice Boltzmann Simulation of 3D Nematic Liquid Crystal near Phase Transition

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Abstract: Phase transition between nematic and isotropic liquid crystal is a very weak first order phase transition. We avoid to use the normal Landau-de Gennes's free energy that reduces a strong first order transition, and set up a data base of free energy calculated by means of Tao-Sheng-Lin's extended molecular field theory that can explain the experiments of the equilibrium properties of nematic liquid crystal very well. Then we use the free energy method of lattice Boltzmann developed by Oxford group to study the phase decomposition, pattern formation in the flow of the liquid crystal near transition temperature.

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