INSTABILITY OF THE NEMATIC-LIKE PHASES FILLED WITH IMPURITIES AGAINST THE FORMATION OF MODULATED STRUCTURES

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S u m m a r y

We examine spatial distribution of impurity rigid-sphere-like macroparticles in the mesomorphic liquid crystal host. Using continuum statistical mechanical theories, we analyze the thermodynamic conditions necessary for a modulated lamellar-structure to appear. There is a long-range effective interaction between the impurity particles. This interaction is considered as being responsible for the formation of superstructures. In the general case, this interaction includes two components: a van der Waals-type direct interaction and an indirect interaction (through the director-field distortions). The last one depends on both the temperature of a sample and the concentration of particles. This effective interaction controls the structure and properties of the system. Analytical solutions for a director-field distortion, density inhomogeneity of the host medium, temperature of the formation of a modulated structure, and its spatial period are obtained. The proposed theoretical approach can be applied to other anisotropic and inhomogeneous systems.