Prewetting behavior in the presence of an external field in nematic liquid crystal

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The study of surface-induced ordering in liquid crystals is of special importance, not only for technological applications but also from a fundamental scientific point of view for reviews. In the this work, influence of an external magnetic field on the prewetting transition and on the wetting behavior of a nematic liquid crystal with positive magnetic anisotropy under condition of weak homotropic anchoring has been studied. Using the Landau–de Gennes model supplement by Nobili-Durand surface free energy[2], the existence and stability of paranematic wetting layers close to the substrate and below the nematic-isotropic temperature are discussed. Wetting has been studied in the presence of a magnetic field not only for surface-induced prolate order $S> 0$, where the liquid-crystal molecules align preferentially along the surface normal, but also for oblate order $S< 0$, where they want to be parallel to the interface. The thermodynamic phase diagram has been calculated (Fig.1). Solving the free energy equation numerically, it has been found that the magnetic field could increase first-order transition temperature as a linear behavior with the zero field bulk order parameter slope which terminates at the tricritical point(Fig.2). After that the variation of the order parameter is gradual[2].

References

(1)M. Nobili and G. Durand, Phys. Rev. A **1992** 46, R6174.
(2)E. Kadivar, Phys. Rev. E **2008**, 78, 031706.

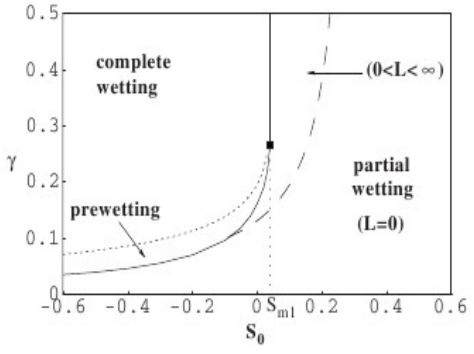

Fig1. Wetting diagram

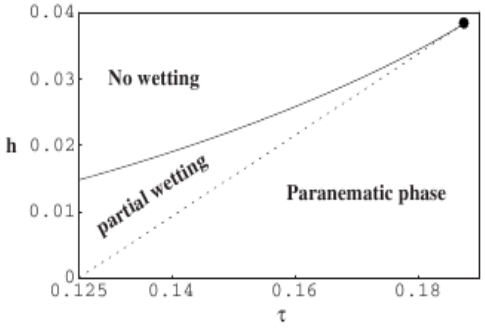

Fig2.Magnetic field as function of temperature