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On the critical behaviour of two-dimensional liquid crystals ANA I. FARIÑAS-SÁNCHEZ, Departamento de Fisica, Universidad Simon Bolivar, Venezuela, ROBERT BOTET, Laboratoire de Physique des Solides, Universite Paris-Sud, France, BERTRAND BERCHE, Groupe de Physique Statistique, Institut Jean Lamour, France, RICARDO PAREDES, Laboratorio de Simulacion, Instituto de Matematicas. Unidad Cuernavaca. UNAM, Mexico — The Lebwohl-Lasher (LL) model is the traditional model used to describe the nematic-isotropic transition of real liquid crystals. In this paper, we develop a numerical study of the temperature behaviour and of finite-size scaling of the two-dimensional (2D) LL-model. We discuss two possible scenarios. In the first one, the 2D LL-model presents a phase transition similar to the topological transition appearing in the 2D XY-model. In the second one, the 2D LL-model does not exhibit any critical transition, but its low temperature behaviour is rather characterized by a crossover from a disordered phase to an ordered phase at zero temperature. We realize and discuss various comparisons with the 2D XY-model and the 2D Heisenberg model. Having added finite-size scaling behaviour of the order parameter and conformal mapping of order parameter profile to previous studies, we analyze the critical scaling of the probability distribution function; hyperscaling relations and stiffness order parameter and conclude that the second scenario (no critical transition) is the most plausible.

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