Renormalization group predictions for infinite-order wetting.

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We study the effect of thermal fluctuations on the wetting phase transitions of infinite order and of continuously varying order, recently discovered within a mean-field density-functional model for three-phase equilibria in systems with short-range forces and a two-component order parameter. Using linear functional renormalization group (RG) calculations within a local interface Hamiltonian approach, we show that the infinite-order transitions are robust. The exponential singularity (implying $2 - \alpha_s = \infty$) of the surface free energy excess at infinite-order wetting as well as the precise algebraic divergence (with $\beta_s = -1$) of the wetting layer thickness are not modified as long as $\omega < 2$, with ω the dimensionless wetting parameter that measures the strength of thermal fluctuations. The interface width diverges algebraically and universally (with $\nu_\perp = 1/2$). In contrast, the non-universal critical wetting transitions of finite but continuously varying order are modified when thermal fluctuations are taken into account, in line with predictions from earlier calculations on similar models displaying weak, intermediate and strong fluctuation regimes.