# Polymer Melts, Blends, and Solutions Near Patterned Surfaces

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Depending on whether the net polymer-surface interactions are repulsive or attractive, polymer melts near impenetrable surfaces yield depletion or enhancement layers, respectively, a phenomenon implying that a theory for interfacial profiles of polymer melts near a hard wall must treat the system as compressible. Compressible system models for polymer blends are mathematically identical to those describing polymer profiles in incompressible models of polymer solutions proximate to hard surfaces. A minimal Edwards-type model for a compressible polymer blend (or equivalently for an incompressible solution containing polymers of two species and a small molecule solvent) near a "two-color" patterned surface requires the specification of *thirteen* model parameters, a huge parameter space that calls for an analytical description to enable probing wide ranges of possible behaviors. We employ a recent analytic density functional-self-consistent field theory [1,2] to derive analytical expressions for the density profiles of compressible homopolymer melts and blends (and the mathematically equivalent incompressible polymer solutions containing one and two polymer species, respectively) near impenetrable surfaces with one or two-dimensional periodic surface patterns. Specific applications are illustrated for striped and checkerboard patterns. The profiles in the plane of the surface and in a plane orthogonal to the surface are governed by relative values of the polymer sizes, the dimensions of the surface pattern, and the bulk correlation lengths for density and composition fluctuations, the latter of which diverge as a spinodal is approached and thereby exert profound influence on thedensity profiled.

[1] K.F. Freed, *J. Chem. Phys.* **103**, 3230 (1995).
[2] K.F. Freed, *J. Chem. Phys.* **105**, 10572 (1996).