Symmetry Breaking In Block Copolymer Thin Films
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Recent experiments by Stein and Kramer show that thin films of poly(styrene-
b-vinylpyridine) diblock copolymer undergo a discontinuous transformation from
hexagonally-close packed spheres to a Fmmm orthorhombic packing as the thick-
ness of the film is increased; beyond the hcp-Fmmm transition, the unit cell deforms
to asymptotically approach bcc symmetry, which is preferred in the bulk system. We
use a Landau-type theory to construct various scenarios of symmetry-breaking in
this system. High resolution SCFT calculations show the nature of the competition
between the preferred packing in the bulk and that at the interface. We conclude
that character of the transition from thin-film to bulk behavior may be either con-
tinuous or discontinuous, depending on the bulk properties of the block copolymer
and the surface energy.

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