Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Orientation competition of lamellar phases in sheared block copolymers via hydrodynamic instability ZHI-FENG HUANG, JORGE VINALS, McGill University — We study the shear alignment of three dimensional lamellar diblock copolymers for achieving macroscopic order in defected, multidomain systems. We find that the competition between differently oriented microdomains, and thus the orientation selection between lamellar phases, is determined by the domain viscosity contrast which originates from different uniaxial domain symmetries relative to the imposed shear. This variation of domain viscosity causes hydrodynamic instability at high enough shear frequencies, breaking the degeneracy between parallel and perpendicular orientations in the system. The instability is found to obey a thin layer effect, inducing a size dependence of perpendicular domain expansion. Our calculations also suggest that the effective boundary of the experimentally observable regime with predominant perpendicular alignment follows a power law behavior between shear amplitude and frequency, with an exponent equal to 3/4.

Zhi-Feng Huang
McGill University

Date submitted: 01 Dec 2005 Electronic form version 1.4