Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Unconventional Spinodal Surface Fluctuations on Polymer Films[1]

YONG JIAN WANG, OPHELIA K. C. TSUI, Department of Physics and Institute of Nano Science and Technology, Hong Kong University of Science and Technology

— We study the temporal growth pattern of surface fluctuations on a series of spinodally unstable polymer films where the instability is adjustable by the film thickness, h_0. For the most unstable film studied (whose $\left|\frac{h_0-h_{sp}}{h_{sp}}\right| = 0.988$; h_{sp} is the thickness where the second derivative of the interfacial potential of the film equals to zero), the growth rate function of the surface modes as a function of the wavevector fits well to the mean-field theory. As the film thickness is increased such that $\left|\frac{h_0-h_{sp}}{h_{sp}}\right| \leq 0.977$, the mean-field theory demonstrates marked disagreement with experiment, notwithstanding provision of the known corrections from high-order terms and thermal noises. We show that the deviations arise from large-amplitude fluctuations induced by homogeneous nucleation, which is not accounted for in the conventional treatments.

[1]We acknowledge financial support of the Research Grant Council of Hong Kong through the projects HKUST6070/02P and 603604.

Ophelia K. C. Tsui
Department of Physics and Institute of Nano Science and Technology
Hong Kong University of Science and Technology

Date submitted: 11 Jan 2006 Electronic form version 1.4