Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Time Evolution Study on the Spinodal Dewetting of Polymer Films[1] YONG JIAN WANG, FENGCHAO XIE, OPHELIA K.C. TSUI, Institute of Nano Science and Technology and Physics Department, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong — Liquid films deposited on non-wettable substrate surfaces are unstable and may rupture spontaneously into liquid droplets. It has been suggested that the initial rupturing process is similar to that of spinodal decomposition. We used atomic force microscopy to investigate the time evolution of the spinodal dewetting of polystyrene (PS) thin films on oxide- coated silicon, which enables us to measure $\Gamma(\lambda)$, the spectroscopic initial rupturing rate of the films. We found that $\Gamma(\lambda)$ demonstrates a peak at a wavelength, λ_{max}, and falls to zero either when λ increases towards ∞ or decreases towards $\sqrt{2}/2$ λ_{max}. The data indeed fit well to $\Gamma(\lambda) = \Gamma(\lambda_{\max})(2\lambda_{max}^{-2}\lambda^{-2} - \lambda^{-4})\lambda_{\max}^{4}$, expected from the result of Cahn for the spinodal decomposition rate of phase separating binary mixtures.

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

Yong Jian Wang
Institute of Nano Science and Technology and Physics Department
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon, Hong Kong

Date submitted: 14 Mar 2005 Electronic form version 1.4