

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**A Unique Two-Stage Dewetting of Ultrathin Films of Entangled Chains Solution-Cast on a Deformable Surface** TONY MING-HSUN YANG, S.Y. HOU, ARNOLD CHANG-MOU YANG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, F.C. CHANG, C.F. WANG, Department of Applied Chemistry, National Chiao Tung University, Hsinchu, Taiwan — Stability of polystyrene (PS) thin films ( $200\text{k} \leq M_w \leq 2\text{M}$ ,  $20\text{ nm} \leq h \leq 80\text{ nm}$ ) on a deformable surface of low energy at  $170\text{ }^\circ\text{C}$  was investigated. A unique two-stage dewetting process was discovered and the magnitude of total forces driving the dewetting was determined from the strong substrate interaction. The film dewet by first nucleating small holes which grew rapidly but subsequently ran into a complete rest. Additional annealing of more than 4.5 hours, however, induced a second stage dewetting initiated from the intact region. The newly initiated holes were characterized with fingers growth that broke down into tiny droplets concurrent to holes expansion. The dewetting force was estimated to be around  $0.036\text{ N/m}$  and decrease with aging time. Substrate interactions appeared to have a significant effect of increasing surface energy, hampering the rate of dewetting. This work is supported by Air Force (AFOSR-04-4074) and National Science Council of Taiwan.

Arnold Chang-Mou Yang  
Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan

Date submitted: 29 Dec 2005

Electronic form version 1.4