Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Confinement-Induced Molecular Stresses and Wetting Instability in Ultrathin Polymer Films Y. CHEIN, P.W. LEE, A.C.-M. YANG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan — Chain packing and molecular behavior of polymers confined below unperturbed coil sizes are still poorly understood. To explore the physical state and condensation process, molecular recoiling stresses in polystyrene films (4-100 nm) were measured through wetting instability at above T_g(100 C). The films demonstrated strikingly different instability mechanisms in regimes divided by entanglement molecular weight (M_e). Moreover, the recoiling stress decreased with chain length above M_e, consistent with the condensation process dominated by solvent evaporation, but plunged below M_e, apparently due to diminishing deformations. A small fraction of MEH-PPV added in films manifested photoluminescence (PL) following the same trend as recoiling stress confirming stress-enhanced PL characteristic of conjugated polymers. As aging temperature lowered but still above T_g, film stability increased but recoiling stress underwent significant changes, in contrast to that below T_g where no changes was observed.

Yi Chein
Department of Materials Science and Engineering,
National Tsing Hua University, Hsinchu, Taiwan

Date submitted: 06 Dec 2010 Electronic form version 1.4