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Molecular recoiling forces in ultra-thin films of long entangled polymer chains ARNOLD CHANG-MOU YANG, TONY MING-HSUN YANG, SEN-YEN HOU, YU-LUN CHANG, Department of Material Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan — Molecular recoiling force stemmed from non-equilibrium chain conformation was found to play a very important role in the dewetting stability of polymer thin films. Correct measurements and inclusion of this molecular force into thermodynamic consideration are crucial for analyzing dewetting phenomena and nanoscale polymer chain physics. This force was measured using a simple method based on contour relaxation at the incipient dewetting holes. The recoiling stress was found to increase dramatically with molecular weight and decreasing film thickness. The corresponding forces were calculated to be in the range from 9.0 to 28.2 mN/m, too large to be neglected when compared to the dispersive forces ($\sim$10 mN/m) commonly operative in thin polymer films. This work is supported by Air Force (AFOSR-04-4074) and National Science Council of Taiwan.

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