Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Autophobic Dewetting of PS/dPS-*b*-PVP Blend Thin Films

HUIMAN KANG, Sch. of Chem. Eng., SNU, Seoul 151-744, Korea, BUMJOON KIM, MRL, UCSB, CA 93106, U.S.A., SEUNG-HEON LEE, Corporate R&D, LG Chemical/Research Park, Daejeon 305-380, Korea, KOOKHEON CHAR, Sch. of Chem. Eng., SNU, Seoul 151-744, Korea, EDWARD J. KRAMER, MRL, UCSB, CA 93106, U.S.A. — The stability of polystyrene (PS) films on silicon oxide surface was improved by adding a symmetric deuterium-labeled polystyrene- block-poly(2-vinylpyridine) (dPS-*b*-PVP). Above 3 wt% loading of dPS-*b*-PVP in the blend thin films, autophobic dewetting, however, has occurred. The autophobic dewetting of PS thin films was investigated by optical microscopy (OM) and atomic force microscopy (AFM). Since the PVP block interacts with the silicon oxide substrate more favorably, the dPS-*b*-PVP is segregated at the interface between the PS film and the silicon oxide layer. Dynamic secondary ion mass spectrometry is also employed to obtain the normalized interfacial excess ($\xi = \mathrm{z}^*{}_{PS}/\mathrm{R}_{g,PS}$) of the segregated deuterium-labeled block copolymer, yielding a quantitative criterion for the chain stretching of polymer brushes. The value of ξ initially increases with increase in the dPS-*b*-PVP content of the blend films and it levels off at 0.365 above 3 wt% of block copolymer. The segregation of dPS-*b*-PVP toward the silicon oxide substrate causes the entropy difference between PS homopolymers and dPS blocks in the dPS-*b*-PVP, which eventually leads to the autophobic dewetting of the PS films from the segregated dPS-*b*-PVP layer.

Huiman Kang
Sch. of Chem. Eng., SNU, Seoul 151-744, Korea

Date submitted: 22 Mar 2013

Electronic form version 1.4