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**Internal Phase Separation Induces Dewetting in Multicomponent Polymer Films** HYUN-JOONG CHUNG, RUSSELL J. COMPOSTO, MSE and LRSM, U. of Pennsylvania, KOHJI OHNO, TAKESHI FUKUDA, ICR, Kyoto U. — Thin liquid films that dewet from their substrate are ubiquitous as demonstrated by the beading of paint on oily surface. Although most coatings contain more than one component, the dewetting mechanisms in multicomponent films are not understood. Using dPMMA:SAN (50:50) films (550 nm) with or without nanoparticles (NP), we demonstrate, for the first time, that the Laplace pressure induced by internal phase-separated structure is the driving force for roughening and rupture in polymer blend films. Three NP were investigated, namely $NP_A$, $NP_B$, and $NP_C$ which either partition into dPMMA or weakly and strongly segregate to the dPMMA/SAN interface, respectively. $NP_B$ are more effective than $NP_A$ at stabilizing the film, whereas $NP_C$ are able to prevent film rupture. Upon annealing, roughened films display a periodic, lacey structure, resembling patterns from spinodal dewetting. The fluctuation periodicity scales with roughness evolution as $\lambda_s \propto R_q^{1/4}$ for neat blends and blends with $NP_A$, whereas the scaling breaks down for blends containing $NP_B$ and $NP_C$. These studies show that phase separation is responsible for film roughening.

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