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Capillary instability of periodic polymer structures: Influence of viscosity, substrate confinement and local curvature ZHENG ZHANG, YIFU DING, Univ of Colorado - Boulder — We investigate the simultaneous capillary instability among periodic polymer lithographic structures suspended on an immiscible viscous medium. The first system we studied was straight polystyrene (PS) stripes arranged in parallel in PMMA medium. When annealed at a temperature above the glass transition temperature of both polymers, the stripes undulated and then ruptured via capillary instability. We found that the PS-to-PMMA viscosity ratio strongly affected the rupture kinetics, while it had little influence on the rupture wavelength. The rupture behavior of those stripes could be drastically altered due to initial spacing and substrate confinement. For closely-neighboring stripes that were confined on a rigid substrate, the capillary waves became correlated in-phase among neighbors. Under strong confinement, the capillary rupture was always correlated, irrespective of the viscosity ratio. In addition, we examined the influence of in-plane curvature on capillary instability in concentrically arranged PS rings. When the rings were relatively far apart, their rupture behaviors were independent from each other; when they were close to each other, the primary mode in the capillary breakup became strongly correlated from the center towards the peripheral.

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