

Abstract Submitted
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Capillary wrinkling of thin bilayer polymeric sheets¹ JOOYOUNG CHANG, NARAYANAN MENON, THOMAS RUSSELL, Univ of Mass - Amherst — We have investigated capillary force induced wrinkling on a floated polymeric bilayer thin sheet. The origin of the wrinkle pattern is compressional hoop stress caused by the capillary force of a water droplet placed on the floated polymeric thin sheet afore investigated. Herein, we study the effect of the differences of surface energy arising from the hydrophobicity of Polystyrene (PS Mw: 97 K, Contact Angle: 88 °) and the hydrophilicity of Poly(methylmethacrylate) (PMMA Mw: 99K, Contact Angle: 68 °) on two sides of a bilayer film. We measure the number and the length of the wrinkles by broadly varying the range of thicknesses of top (9 nm to 550 nm) and bottom layer (25 nm to 330 nm). At the same, there is only a small contrast in mechanical properties of the two layers (PS E = 3.4 GPa, and PMMA E = 3 GPa). The number of the wrinkles is not strongly affected by the composition (PS(Top)/PMMA(Bottom) or PMMA(Top)/PS(Bottom)) and the thickness of each and overall bilayer system. However, the length of the wrinkle is governed by the contact angle of the drop on the top layer of bilayer system. We also compare this to the wrinkle pattern obtained in monolayer systems over a wide range of thickness from PS and PMMA (7 nm to 1 μ m).

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