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Slip and flow dynamics of polydisperse thin polystyrene films.

SEYED MOSTAFA SABZEVARI, Concordia university, JOSHUA D. MCGRAW, KARIN JACOBS, Saarland University, PAULA M. WOOD-ADAMS, Concordia university — We investigate the slip of binary and ternary mixtures of nearly monodisperse polystyrene samples on Teflon-coated (AF2400) silicon wafers using dewetting experiments. Binary mixtures of long and short chains along with ternary mixtures with a fixed weight-average molecular weight M_w but different number-average molecular weight M_n were prepared. Thin films of ca. 200 nm were spin coated on mica from polymer solutions and transferred to Teflon substrates. Above the glass transition temperature T_g the films break up via nucleation and growth of holes. The hole growth rate and rim morphology are monitored as a function of M_n and annealing protocol of the films before transfer to Teflon substrates. Slip properties, accessed using hydrodynamic models, and flow dynamics are then examined and compared. We found that the rim morphology and slip of polystyrene blends on Teflon depends on the molecular weight distribution. Similarly, flow dynamics is affected by the presence of short chains in mixture. Moreover, we can provoke differences in slip by choosing appropriate annealing and film transfer protocols for PS films that have first been spin cast on mica surfaces.

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