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Capillary levelling in thin polymer films as a nano-rheological tool to probe interface dynamics JOSHUA MCGRAW, OLIVER BAEUMCHEN, MELISSA FERRARI, PAUL FOWLER, KARI DALNOKI-VERESS, Department of Physics & Astronomy and the Brockhouse Institute for Materials Research, McMaster University, Hamilton, ON, Canada, L8S 4M1 — Entanglement of polymer chains in confinement is modified as a result of altered chain conformations. According to Silberberg's principle, chain segments are reflected at an interface causing a reduction of the inter-chain entanglement density. If the interface is transient, local polymer conformation changes can be inferred from a temporal change in flow properties: over time polymer chains become more entangled, thus there is more resistance to flow. Here, we measure the gradual disappearance of an entropic interface between two melts of identical polymer chains during the flow of stepped bilayer polymer films. Samples are prepared in the glassy state and, when in the melt, flow to relieve the Laplace pressure gradient induced by a step in the topography (McGraw *et al.*, Soft Matter, 2011). Our results reveal the dynamics of re-entanglement across the transient entropic interface.

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