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Self-similarity and energy dissipation in stepped polymer films¹ JOSHUA MCGRAW, Department of Physics & Astronomy and the BIMR, Mc-Master University, Hamilton, ON, Canada, THOMAS SALEZ, Laboratoire de Physico-Chimie Theorique, UMR CNRS Gulliver 7083, ESPCI, Paris, France, OLIVER BAEUMCHEN, Department of Physics & Astronomy and the BIMR, McMaster University, Hamilton, ON, Canada, ELIE RAPHAEL, Laboratoire de Physico-Chimie Theorique, UMR CNRS Gulliver 7083, ESPCI, Paris, France, KARI DALNOKI-VERESS, Department of Physics & Astronomy and the BIMR, McMaster University, Hamilton, ON, Canada — We have recently learned how to prepare polymer films whose only feature is a step in the height profile. In the melt, Laplace pressure drives a flow that levels the topography, with the excess energy of the height step being dissipated by viscosity. It has been observed that the profiles are selfsimilar in time for a variety of molecular weights and geometries. Given the surface tension, this simple observation allows a precise measurement of the viscosity by comparison with numerical solutions of the thin film equation. It is also possible to derive a master expression for the time dependence of the excess surface energy as a function of the material properties and film geometry. Thus, all geometries and molecular weights fall on a single temporal curve. The material parameter allowing this collapse is the capillary velocity – the ratio of the surface tension to the viscosity.

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