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Photodirecting Marangoni Flow to Pattern Thin Polymer Films: Decoupling Viscosity and Diffusivity CHAE BIN KIM, AMANDA JONES, DUSTIN JANES, TALHA ARSHAD, ROGER BONNECAZE, CHRISTOPHER ELLISON, The University of Texas at Austin — The Marangoni effect causes liquids to flow towards localized regions of higher surface tension. In thin polymer films, this effect could offer a practically useful route to manufacture topographically patterned surfaces. In this presentation, we report a photochemical strategy to harness Marangoni flow as a versatile patterning method along with comparisons to a theoretical model that reveals the underlying physics of this process. The model agrees well with experiments with no adjustable parameters. It further indicates that higher aspect ratio features are favored by large surface tension gradients, low diffusivities and low viscosities. However, as described by the Rouse model, low viscosities are generally correlated with high diffusivities; diffusivity is also an important factor in the timescale by which the spatial surface tension patterns decay. This coupling between diffusivity and viscosity could critically limit feature aspect ratio for any given surface tension pattern. A potential strategy that decouples diffusivity and viscosity of the film components will be presented.

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