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Patterning Polymer Films with Bidirectional Control of Marangoni Flow by Photochemically Manipulating Surface Tension CHAE BIN KIM, DUSTIN JANES, SUNSHINE ZHOU, AUSTIN DULANEY, CHRISTOPHER ELLISON, University of Texas at Austin - McKetta Department of Chemical Engineering — Small variations in temperature or composition at a fluid interface, often spontaneously generated, can cause local changes in surface tension and promote dramatic movement of fluids through convective motion. This phenomenon, often referred as Marangoni convection, is typically experienced in everyday life as a macroscopic and seemingly stochastic phenomenon. One might imagine attempting to direct this process for reproducibly forming microscale and nanoscale patterns. While this might initially seem impractical, here we will report a photochemical strategy to harness the Marangoni convection as a versatile patterning method. Two photo-exposures with different irradiating wavelengths were applied to a solid, glassy styrene-acrylic copolymer thin film. Each photo-exposure imposes either a higher or lower surface energy in the light exposed regions without inducing topography on the flat film surface. Once this solid film is heated to a liquid state, however, bidirectional Marangoni-flows occur spontaneously from low-to-high surface tension regions.

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