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Design and Fabrication of Novel Polymeric Thin Film Micro-Optical Ring Resonators By Thermocapillary Patterning[1] YANBING ZHU, KEVIN FIEDLER, CHENGZHE ZHOU, SANDRA TROIAN, California Institute of Technology, 1200 E. California Blvd, MC 128-95, Pasadena, CA 91125 — Many interesting physical phenomena at the micro or nanoscale derive from the competition between forces which act exclusively at an interface separating two media such as air and liquid. In particular, we have been exploring a nanofilm patterning technique that exploits the opposition between thermocapillary and capillary forces to form desired 3D shapes which then solidify in situ. In this talk, we describe efforts to fabricate micro-optical ring resonators by projecting thermal distributions onto the surface of a molten polymer film. These distributions are imposed by thermal conduction from patterned preforms on a chilled sapphire window placed in close proximity to the film surface. This non-contact, single-step fabrication process results in solidified shapes whose ultra smooth surfaces minimize scattering losses. While both linear and ring-like waveguides have been fabricated successfully, attempts to conjoin two such elements has been compromised by proximal fluid effects. We describe results of finite element simulations used to overcome this challenge and fabricate optimal shapes.

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