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**Optical Characterization of Polymeric Waveguides Fabricated by Thermocapillary Replication**[1] KEVIN FIEDLER, S. M. TROIAN, California Institute of Technology, 1200 E. California Blvd., MC 128-95, Pasadena, CA 91125
— Demand for increasing bandwidth has generated interest in optoelectronic circuits which incorporate polymeric components such as optical waveguides. Such components are usually cast into planar single- and multimode waveguides structures using techniques such as embossing, photolithography, dip coating or direct laser writing. In this talk, we describe an alternative technique based on thermocapillary replication for fabricating optical waveguides. A chilled preform mask held in close proximity to the surface of a polymer nanofilm draws fluid toward the mask by thermocapillary forces. The ensuing fluid shape, which replicates the pattern set by the mask, is then solidified in situ. We have used various mask patterns to enforce film surface thermal distributions purposely designed to pool liquid into ribbon-like shapes for use as rectilinear waveguides. As expected, capillary effects imbue the structures with ultrasmooth rounded and not rectangular shapes. We discuss measurements of the polarization extinction ratio and coupling efficiency for these modified shapes. For waveguide structures with large aspect ratios, there is evidence of strong geometrical birefringence between the TE and TM polarizations including shapes which altogether exclude TM modes.

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