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Thermocapillary Technique for Shaping and Fabricating Optical Ribbon Waveguides KEVIN FIEDLER[1], SANDRA TROIAN, California Institute of Technology — The demand for ever increasing bandwidth and higher speed communication has ushered the next generation optoelectronic integrated circuits which directly incorporate polymer optical waveguide devices. Polymer melts are very versatile materials which have been successfully cast into planar single- and multimode waveguides using techniques such as embossing, photolithography and direct laser writing. In this talk, we describe a novel thermocapillary patterning method for fabricating waveguides in which the free surface of an ultrathin molten polymer film is exposed to a spatially inhomogeneous temperature field via thermal conduction from a nearby cooled mask pattern held in close proximity. The ensuring surface temperature distribution is purposely designed to pool liquid selectively into ribbon shapes suitable for optical waveguiding, but with rounded and not rectangular cross sectional areas due to capillary forces. The solidified waveguide patterns which result from this non-contact one step procedure exhibit ultrasmooth interfaces suitable for demanding optoelectronic applications. To complement these studies, we have also conducted finite element simulations for quantifying the influence of non-rectangular cross-sectional shapes on mode propagation and losses.

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Sandra Troian
California Institute of Technology

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