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Thermocapillary Lithgraphy: Large Area Patterning of Nanoscale Polymer Films MATHIAS DIETZEL, SANDRA TROIAN, Dept of Applied Physics, California Institute of Technology, Pasadena, CA — Photolithographic patterning of semiconductor devices relies on optical projection techniques whose resolution limit is set by the Rayleigh diffraction criterion. While the ultimate resolution is of order 100 nm, photolithography is both costly and time consuming due to multiple step and repeat processes to deposit and strip photoresist layers and the limitation to small and flat areas. Alternative techniques, which are far less costly but offer submicron resolution, are of growing interest for a number of applications involving optoelectonic, photonic or biofluidic components. Here we discuss the novel use of thermocapillary lithography for large area patterning of nanoscale polymer films. We investigate geometries in which a supported fluid bilayer in the presence of a patterned upper substrate is subject to an ultrahigh transverse thermal gradient. Finite element simulations help identify the optimal range of parameter values for achieving minimal pitch and feature size. The simplicity of this technique, coupled with the flexibility in tuning the applied thermal distribution, inherent low cost, and extension to curved substrates, may provide an interesting new fabrication method for the manufacture of polymeric electronic and optical components.

Sandra Troian
Dept of Applied Physics, California Institute of Technology

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