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Glass Nanofiber Fabrication and Devices SCOTT VERBRIDGE, Cornell University, JOSHUA EDEL, SAMUEL STAVIS, JOSE MORAN-MIRABAL, JUN KAMEOKA, DAVID CZAPLEWSKI, HAIQING LIU, HAROLD CRAIGHEAD, SCOTT D. ALLEN, GEOFFREY COATES, Cornell University —
We have integrated electric field assisted spinning (electrospinning) of polymeric materials with photolithography for the fabrication of glass nanostructures. We incorporated spin on glass (SOG) dielectric coating with poly-vinyl-pyrrolidone (PVP) and spun this solution over trenches etched in silicon. A calcination eliminated the PVP polymer from these fibers, while cross-linking the SOG, leaving silica glass fibers with diameters as small as 70 nm. We demonstrated the operation of these fibers as nanomechanical oscillators. We also spun heat depolymerizable polycarbonate (HDPC) fibers over silicon trenches. These fibers were coated with glass by chemical vapor deposition or sputtering, followed by thermal elimination of the polymer core. This yielded suspended glass channels of elliptical cross sections, with inner major and minor axes as small as 75 and 50 nm. These nanochannels offer a low background option for doing fluorescence detection, as demonstrated by single molecule detection, using a confocal microscope, of cellulase enzymes in these channels.

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