Shrink-Induced Nanofabrication

We present a simple, ultra-rapid, and robust method to create large areas of sharp bimetallic nanostructures, coined nanopetals, in a shape memory polymer. We achieve these nanostructures by leveraging the mis-match in stiffness between the retracting pre-stressed polymer sheet and the metallic thin films. We recently developed a new approach to 'shrink' the sheets by 95%. The resulting nanopetals provide tiny hot-spots at their edges which exhibit extremely strong plasmonic effects, confining the emission to small excitation volumes (10^{-18}L) and enhancing the fluorescence intensity of nearby fluorophores by several thousand-folds. The strong surface plasmon effects of these nanopetals in the vicinity of fluorescein excited by two-photon microscopy exhibit over 4000-fold enhancements in fluorescence intensity. These nanostructures are easily and ultra-rapidly created and can be robustly integrated into microfluidics.