

Abstract Submitted
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Actuating Surface-Attached Post (ASAP) Arrays as High Aspect Ratio Actuators¹ JACOB BROOKS, JEREMY CRIBB, MICHAEL FALVO, RICHARD SUPERFINE, University of North Carolina at Chapel Hill — Actuable micropillar arrays are used in a wide range of applications, including controlling surface wettability, manipulating light refraction, and pumping and mixing fluids. Non-invasive magnetic actuation of pillars is favorable for many applications. Magnetically actuatable micropillars have been developed by molding magnetic elastomer nanocomposites. This fabrication route faces significant challenges including uncontrolled aggregation of particles and low optical clarity of the base layer for high quality imaging. We developed a fabrication method that uses centrifugation to control the amount of magnetic material in the micropillars while maintaining optical clarity in the base layer. We created posts with cross-sectional areas of less than 1 square micron and aspect ratios as high as 23:1, but demolding these fragile structures proved challenging. Our demolding method uses solvents to gently swell and de-swell cured elastomer to minimize high strain on the structures. We used our fabrication flexibility to create novel array designs including “herringbone” arrays of adjacent rectangular paddles that can be actuated with controlled phase. Such structures have been shown theoretically to evade the scallop theorem and pump fluids with reciprocal motions.

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