Enhanced magnetic actuation of polygonal micropillar arrays by anisotropic stress distribution

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Shape-reconfiguration of micropillar arrays was achieved by programming arrangement of magnetic particles within polymer matrix. Previous studies have predominantly reported actuation of cylindrical micropillars where the stress distribution is radially balanced within isotropic circular cross-section. In this study, we employ triangular or rectangular cross-sections in order to introduce preferential directionality of magnetic actuation with anisotropic stress distribution. Experimental results are supported by a finite element method (FEM) approach to investigate maximum of magnetic actuation of micropillar with four different geometry. In addition, a liquid droplet pinned on the micropillar arrays undergoes selective depinning and directional spreading by magnetic twisting or bending actuation of micropillars. We will discuss the structure-property relationships between geometry factors of micropillars and magnetic actuation as well as wetting properties.