Chain-Like Arranged Microsphere/Nanorods Magnetic Composite Particles for Enhanced Magnetomechanical Actuation of Micropillar Arrays

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Magnetic deformations of micropillars have been researched with advantage of remote controllability with deep penetration distance. Recently we reported geometric asymmetry effects of the micropillars on the enhanced magnetic bending deformation. Symmetric isosceles triangular cross-sections are identified as ineffective geometry for bending deformations at a given external magnetic field due to distributed stress within the micropillars. Here, we suggest a strategy to enhance magnetic responsivity by introducing percolation and exchange coupling into hybridized hard magnetic nanorods and soft magnetic microspheres. Composite particles of maghemite ferrite and iron are mixed with elastomeric polymer, and formed into the micropillar arrays. Linearly applied magnetic field causes the micropillars to bend by arranging the composite particles into chains. Magnetization and magnetorheological properties of the composite particles will also be discussed to reveal their correlation with magnetomechanical actuation of the micropillars.