Abstract Submitted
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Actuation of High-Aspect-Ratio Magnetoelastic Nanorod Arrays[1] B.A. EVANS, A.R. SHIELDS, University of North Carolina at Chapel Hill Department of Physics, R.L. CARROLL, University of West Virginia Department of Chemistry, R. SUPERFINE, University of North Carolina at Chapel Hill Department of Physics — Nanoscale arrays of actuable rods may have applications as nanoscale mechanical stirrers for microfluidics systems, mechanical actuators, or active antibiofouling surfaces, and may produce interesting photonic effects. In addition, our group is interested in using such nanorod arrays as a model for biological cilia, in order to study fluid flow and mucociliary clearance in the human lung. We have produced nanorod arrays both by lateral self-assembly of metallic rods and by templation of a curable magnetoelastomer. Paramagnetic rods respond to torque applied by magnetic fields and forces applied by magnetic field gradients. We have developed an energy-minimization model which inputs the magnetic, geometric, and elastic properties of our rod arrays and calculates the degree of bending due to magnetic effects. The spatial modulation of 30 microns in the actuation of biological cilia presents a challenge in designing actuating fields for our biomimetic model. We will present a strategy based on our mathematical model to produce spatial modulation of this magnitude in our nanorod arrays.

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