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**A Novel Silicone-Magnetite Composite Material Used in the Fabrication of Biomimetic Cilia** B.L. CARSTENS, Department of Physics and Astronomy, University of North Carolina at Chapel Hill, B.A. EVANS, Department of Physics, Elon University, A.R. SHIELDS, Department of Physics and Astronomy, University of North Carolina at Chapel Hill, J. SU, North Carolina School of Science and Mathematics, S. WASHBURN, M.R. FALVO, R. SUPERFINE, Department of Physics and Astronomy, University of North Carolina at Chapel Hill — We have developed a novel polymer-magnetite composite that we use to fabricate arrays of magnetically actuable biomimetic cilia. Biomimetic cilia are flexible nanorods 750 nm in diameter and 25 microns tall. They generate fluid flows similar to those produced by biological cilia. Polymer-magnetic nanoparticle materials such as ours are becoming increasingly useful in biomedical applications and microelectromechanical systems (MEMS). Comprised of magnetite (Fe3O4), the nanoparticles have a diameter of 5-7 nm and are complexed with a silicone copolymer and crosslinked into a flexible, magnetic solid. Amine groups make up 6-7 percent of the silicone copolymer, providing a simple means of functionalization. We present a detailed mechanical and magnetic analysis of our bulk crosslinked material. The high-aspect ratio biomimetic cilia we create with this magnetite-copolymer complex may have applications in microfluidic mixing, biofouling, and MEMS.

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