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Swimming of Flexible Nanowire Motors ON SHUN PAK, Department of Mechanical and Aerospace Enginering, University of California San Diego, WEI GAO, JOSEPH WANG, Department of Nanoengineering, University of California San Diego, ERIC LAUGA, Department of Mechanical and Aerospace Enginering, University of California San Diego — In this talk, we report on a new nanowire motor which exploits the flexibility of nanowires for propulsion. The motor is made of nickel and silver nanowires, and it is fabricated using a common template-directed electrodeposition protocol. These readily prepared nanomotors display both high dimensional and dimensionless (in body lengths per revolution) propulsion velocities when compared with natural microorganisms and other artificial propellers. Their propulsion characteristics are studied theoretically using an elastohydrodynamic model which takes into account the elasticity of the nanowire and its hydrodynamic interaction with the fluid medium. The theoretical predictions by an asymptotic analysis for small-amplitude swimming are then compared with experimental measurements and we obtain good agreement. Finally, we demonstrate the operation of these nanomotors in a real biological environment (human serum), emphasizing the robustness of their propulsion performance and their promise for biomedical applications.

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