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Control of Biologically Inspired Robotic Microswimmers U. KEI CHEANG, Drexel University, JUN HEE LEE, Korea Institute of Machinery and Materials, DHEERAJ ROY, MIN JUN KIM, Drexel University, BAST LABORATORY TEAM — Flagella have been employed as nanoactuators for biomimetic microswimmers in low Reynolds number fluidic environments. The microswimmers utilize flagellar filaments isolated from Salmonella typhimurium to mimic the spiral-type propulsion mechanism of flagellated bacteria. The microswimmer included a polystyrene microbead conjugated to one or multiple magnetic nanobeads via flagellar filaments using avidin-biotin linkages. Wireless propulsion energy was supplied to magnetic bead by an AC magnetic field, which in turn rotate the bead and induce spiral-type swimming. A magnetic controller consisted of electromagnetic coils arranged in an approximate Helmholtz configuration was designed and constructed. In conjunction with a LabVIEW input interface, a DAQ controller was used as a function generator to induce AC current outputs from the power supply to the magnetic controller in order to generate an AC magnetic field. Numerical analysis was performed to characterize the magnetic controller. A high-speed camera provided real-time imaging of the microswimmer motion in a static fluidic environment. The robotic microswimmers exhibited active propulsion under an AC magnetic field, which demonstrates the possibility for future biomedical applications for drug delivery.

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