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Magnetic Actuation of Self-Assembled DNA Hinges S. LAUBACK, K. MATTIOLI, M. ARMSTRONG, C. MILLER, C. PEASE, C. CASTRO, R. SOORYAKUMAR, The Ohio State University — DNA nanotechnology offers a broad range of applications spanning from the creation of nanoscale devices, motors and nanoparticle templates to the development of precise drug delivery systems. Central to advancing this technology is the ability to actuate or reconfigure structures in real time, which is currently achieved primarily by DNA strand displacement yielding slow actuation times (about 1-10min). Here we exploit superparamagnetic beads to magnetically actuate DNA structures which also provides a system to measure forces associated with molecular interactions. DNA nanodevices are folded using DNA origami, whereby a long single-stranded DNA is folded into a precise compact geometry using hundreds of short oligonucleotides. Our DNA nanodevice is a nanohinge from which rod shaped DNA nanostructures are polymerized into micron-scale filaments forming handles for actuation. By functionalizing one arm of the hinge and the filament ends, the hinge can be attached to a surface while still allowing an arm to rotate and the filaments can be labeled with magnetic beads enabling the hinge to be actuated almost instantaneously by external magnetic fields. These results lay the groundwork to establish real-time manipulation and direct force application of DNA constructs.

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