Abstract Submitted
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Controlled steering and propulsion of nanohelices[1] TAPIO ALA-NISSILÄ, MARIA MICHIKO ALCANZARE, VAIBHAV THAKORE, Aalto Univ — Fuel-free controlled propulsion and steering of in aqueous solutions have been experimentally demonstrated for microscale particles by taking advantage of the coupled rotational and translational motion. The grand challenge at the nanoscale is overcoming thermal effects which can alter the direction of motion and interfere with the propulsion. The hybrid lattice-Boltzmann Molecular Dynamics method with full hydrodynamic interactions and thermal fluctuations [1] is used to demonstrate that controlled propulsion and maneuverability is possible for helically shaped structures at a sufficiently high Péclet number. The magnetic helical structure interacts with a rotating magnetic field. The interaction induces a torque that propels the helix in the fluid through the coupled rotational and translational motion. The Péclet number and the propulsive velocity are quantified at various field frequencies. The propulsive velocities are observed to be linear with the field frequencies up to a certain step-out frequency which depends on the helical structure.
1. S.T.T. Ollila *et al.*, J. Chem. Phys. **134**, 064902 (2011); Multiscale Model. Simul. **11**, 213 (2013).

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