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Modeling the motion of microscale synthetic swimmers ALEXANDER ALEXEEV, VICTOR YASHIN, ROLF VERBERG, ANNA BALAZS, Chemical Engineering Department, University of Pittsburgh, Pittsburgh, PA — By direct numerical simulations, we study the motility of synthetic micro-swimmers in a quiescent fluid. The micro-swimmers examined here are composed of an elastic polymeric material and comprise one or more wiggling tails, which propel the swimmer through its low-Reynolds number environment. The tails are driven to move by a reactive gel, which constitutes part of the swimmer's body. The gel undergoes a periodic swelling and deswelling due to a reaction or an external stimulus. To model the interaction of this micro-swimmer with the surrounding fluid, we adopt our recently developed LBM/LSM approach, which integrates the lattice Boltzmann model (LBM) for fluid dynamics with the lattice spring model (LSM) for the micromechanics of an elastic solid. Using this model, we investigate different aspects of the swimmer's propulsion. In particular, we determine how the properties of the swimmer and the oscillatory gel affect the swimmer's velocity and efficiency. Our goal is to design autonomous micro-swimmers that can be guided along a particular direction in order to perform a specified task.

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