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**Modeling magnetically driven synthetic microcapsules** HASSAN MASOUD, ALEXANDER ALEXEEV, Georgia Institute of Technology — Using computer simulations and theory, we examine how to design magnetically-responsive synthetic microcapsules that able to move in a steady manner in microfluidic channels. These compliant fluid-filled capsules encompass superparamagnetic nanoparticles in their solid shells and, thereby, can be manipulated by alternating magnetic forces. To model the magnetic capsules propelled in fluid-filled microchannels, we employ a hybrid computational method for fluid-structure interactions. This method integrates the lattice Boltzmann model for the fluid dynamics and the lattice spring model for the micromechanics of solids. We show that in circulating magnetic field the capsules propel along sticky microchannel walls. The direction of capsule motion depends on the relative location of the solid surface, whereas the propulsion speed can be regulated through the wall adhesiveness, amplitude and frequency of magnetic forces, and elasticity of capsule's shell. The results indicate that such mobile fluid-filled containers could find application in lab-on-chip systems for controlled delivery of minute amounts of fluidic samples.

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