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Developing a Drug Delivery System Using Magnetic Particles – Tools and Strategies

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Magnetic nanoparticles have been proposed for a variety of applications in biological systems including, killing tumors through hyperthermia and magnetic resonance image (MRI) contrast enhancements. Our work is devoted to investigating the feasibility of using magnetic particles as drug delivery vehicles through high viscosity fluids. To do this we developed an imaging system that can control and visualize magnetic particle motion in a variety of oscillating fields. Depending on the magnetic material used as well as the oscillating/rotating frequency and amplitude of the applied magnetic field, we observe a particle not only to rotate and oscillate but also to wiggle, spin, and flip. These different modes of particle motion are described by a simple mathematically model that we use to further study the behavior of magnetic particle motion in high viscosity fluids.