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Optical Imaging of Magnetic Particle Rotation and Oscillation in High Viscosity Fluids RIVER GASSEN, DENNIS THOMPKINS, GUY HAGEN, KATHRIN SPEBDIER, UCCS Biofrontiers — The purpose of this experiment is to study the oscillation and rotation of nanoparticles in fluids of different viscosities. The investigations have practical applications to the medical field, specifically drug delivery through high viscosity fluids like mucus. Magnetic barium hexaferrite (BaFe12O19) and iron oxide (Fe3O4) particles were suspended in distilled water or various glycerol concentrations. The mixtures had a concentration of 2.50mg/ml for the BaFe12O19 and 1.00mg/ml for Fe3O4. Magnetic particles were exposed to oscillating or rotating magnetic fields and imaged with an optical microscope. Time-varying magnetic fields ranging from 10Hz to 180Hz are created by pairs of home-made wire coils that insert into the microscope. Magnetic field amplitudes can be varied from 0-12 mT. The resulting measured frequency of the particle oscillation or rotation equaled the drive frequency when the drive frequency was less than half the frame rate. For high viscosity fluids, higher magnetic field strength was necessary for particle motion. Further investigation will need to be done to determine how the viscosity, particle size, and drive frequency impact the movement of the particles, going from oscillating at the driving frequency to no particle motion.

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