1. Magnetophoresis of Nonspherical Microparticles in a Uniform Magnetic Field
2. Dynamics of Ellipsoidal Particles in Simple Shear Flows under the Influence of Uniform Magnetic Fields
3. Numerical Investigation of Force-Free Magnetophoresis of Nonspherical Microparticles

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Dynamics of Ellipsoidal Particles in Simple Shear Flows under the Influence of Uniform Magnetic Fields CHRISTOPHER SOBECKI, YANZHI ZHANG, CHENG WANG, Missouri University of Science and Technology — Our recent experiments demonstrated a "torque"-based method to separate nonspherical particles by combining shear flows and uniform magnetic fields. Experiments showed correlation between the lateral migration of the particle and the asymmetry of the particle rotation. To further understand the effect of magnetic field on the particle rotation, we study the rotational dynamics of an ellipsoidal particle, in an unbounded simple shear flow at zero-Reynolds numbers, subject to a uniform magnetic field. A dimensionless parameter,S, is defined to represent the relative strength between the magnetic and hydrodynamic torques. Without magnetic fields, the particle completes a family of periodic rotations known as Jeffery's Orbit. With a magnetic field, we find that there exists a critical value of S (S_{cr}). The particle is able to execute complete rotations for a weak magnetic field ($S<S_{cr}$), and the particle rotation is impeded for a strong magnetic field (S_{cr}). We study the effect of the direction of the magnetic field on the particle rotation. For $S<S_{cr}$, we obtain the relationship between the direction of the magnetic field and the symmetry property of the particle rotation. For $S>S_{cr}$, we determine the steady-state angles of the particle, and analyze their stability.

Cheng Wang
Missouri Univ of Sci
Tech

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