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Dynamics of magnetic particles suspended in Newtonian fluids under magnetic field MINGYANG TAN, TRAVIS WALKER, Oregon State Univ — Anisotropic structures are commonly found in natural materials. Researchers are committed to developing meta-materials that mimic natural materials by introducing anisotropic filler particles. These materials can exhibit enhanced magnetic, mechanical, optical, and diffusive properties. In this study, a magnetic field is used to align magnetic oblate spheroids. We present an analytic solution based on a single-particle Stokes-flow model that describes the planar alignment of the particle in a rotating magnetic field. The analytic solution covers the full range of the magnetic field frequency agreeing well with our experimental results. Asymptotic solutions are also developed at both the high-frequency and the low-frequency limits of the field. The induced dipole of each particle can create its own magnetic field that can interact with neighboring particles, causing particles to aggregate. Different structures of particles are formed depending on the characteristics of the field, i.e., one-dimensional columns of particles in a constant field and two-dimensional sheets of particles in a rotating field. To simulate the realistic dynamics of the phenomena, we include hydrodynamic interactions between the particles via Stokesian dynamics.

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