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Numerical Investigation of Paramagnetic Elliptical Microparticles in Curved Channels and Uniform Magnetic Fields CHRISTOPHER SOBECKI, JIE ZHANG, CHENG WANG, Missouri University of Science Technology — We present a numerical investigation on the dynamics of a paramagnetic elliptical particle traveling in a curved channel under a low Reynolds number Poiseuille flow and a uniform magnetic field. By applying a direct numerical simulation and using a finite element method, based on an arbitrary Lagrangian-Eulerian approach, we focus on the particle's rotation and radial migration. Our numerical results show that the particle's rotational and radial dynamics are affected by the channel geometry, the strength and direction of the magnetic field, and the particle shape. The migration of the particle was examined after executing a pi rotation and at the exit of the curved channel with and without a uniform magnetic field. In the absence of a uniform magnetic field, the net migration of the particle remains zero due to the symmetry of its rotation. On the other hand, in the presence of a uniform magnetic field, the symmetry is broken, and the net migration of the particle-wall distance increases along with the magnetic field strength. We determine that the particle's migration is due to its rotational dynamics altered by the magnetic torque that constantly changes direction during transportation.

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