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Shape-based separation of microparticles with magnetic fields CHENG WANG, RAN ZHOU, Missouri Univ of Sci Tech — Precise manipulations, e.g., sorting and focusing, of nonspherical micro-particles in fluidic environment has important applications in the fields of biology sciences and biomedical engineering. However, non-spherical microparticles are hard to manipulate because they tumble in shear flows. Most of existing techniques, including traditional filtration and centrifugation, and recent microfluidic technology, have difficulty in separating microparticles by shape. We demonstrate a novel shape-based separation technique by combining external magnetic fields with pressure-driven flows in a microchannel. Due to the magnetic field, prolate ellipsoidal particles migrate laterally at different speeds than the spherical ones, leading to effective separation. Our experimental investigations reveal the underlying physical mechanism of the observed shape-dependent migration. We find that the magnetic field breaks the rotational symmetry of the nonspherical particles, and induces shape-dependent lift force and migration velocity.

Cheng Wang
Missouri Univ of Sci
Tech

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