

Abstract Submitted
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Linear Stability Analysis Of A Magnetic/Non-Magnetic Fluid Coflow In The Presence Of A Magnetic Field ANINDYA DE, ISHWAR PURI, Virginia Polytechnic Institute and State University — Ferrofluids are colloidal suspensions of magnetic nanoparticles in carrier liquids. Being both magnetic and a liquid, they are readily maneuvered from a distance using magnetic fields. When functionalized with different antibodies or medicinal compounds, the ferrofluid can be used for various purposes, e.g., to detect bacteria or for targeted drug delivery. We have considered a coflow where two fluids are separated by a vertical surface parallel to the direction of gravity. For simplicity the flow is assumed to be inviscid and incompressible. We have investigated two configurations depending on the position of the magnet relative to the channel. When the magnet is placed adjacent to the vertical wall along which the magnetic fluid is flowing, the magnetic fluid stays close to the wall unless perturbed by the shear due to a velocity difference. It results in a very stable system. In the second case, the magnet is placed close to the wall along which the non-magnetic fluid flows. The magnetic fluid gets attracted towards the magnet and tries to flow toward it when it gets resisted by the non-magnetic fluid. This configuration is inherently unstable and responds to small perturbations. The surface tension force resists the perturbation of smaller wavelengths. The relative effects of different forces are characterized by magnetic pressure number, Weber number and magnetic Weber number.

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