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Interfacial deformation and jetting of a magnetic fluid[1] SHAHRIAR AFKHAMI, LINDA CUMMINGS, New Jersey Institute of Technology — An attractive experimental technique, for forming and collecting aggregates of magnetic material at a liquid-air interface by an applied magnetic field, was recently addressed theoretically [Soft Matter, 2013, 9, 8600-8608]. These authors find that, when the magnetic field is weak, the deflection of the liquid-air interface is static, while for sufficiently strong fields, the interface destabilizes and forms a jet. Motivated by this work, here we develop a numerical model for the closely-related problem of solving two-phase Navier-Stokes equations coupled with the static Maxwell equations. We computationally model the magnetically induced interfacial deflection of a magnetic fluid (ferrofluid) and the transition into a jet by a magnetic field gradient from a permanent magnet. We analyze the shape of the liquid-air interface during the deformation stage and the critical magnet distance, for which the static interface transitions into a jet. We draw conclusions on the ability of our numerical model to predict the large interfacial deformation and the consequent jetting, free of any fitting parameter.

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