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Pattern formation and temporal undulations of plane magnetic droplet[1] CHAMKOR SINGH, Indian Institute of Technology Kharagpur India, ARUP KUMAR DAS, Indian Institute of Technology Roorkee India, PRASANTA KUMAR DAS, Indian Institute of Technology Kharagpur India — In this study, we numerically investigate the time-dependent response of a ferrofluid droplet under an impulsively applied uniform magnetic field in a zero gravity environment. It is identified that two characteristic non-dimensional groups, namely, the Laplace number La and the magnetic Bond number Bo_m, primarily influence the response of the droplet. It is found that the nature of the time response can be either monotonic or undulating depending on the parameters. The transition between the two is smooth. In addition to the previously well-known regimes of elliptic and acicular ferrofluid droplet shapes, a new regime on the $La - Bo_m$ plane is found where we observe some unique bifurcating patterns at the poles of the droplet. The temporal aperiodic to periodic mode transition on the $La - Bo_m$ plane is found to be governed by La and the spatial droplet deformation and its final equilibrium configuration is found to be governed by Bo_m. The mechanism behind the elliptic to non-elliptic or elliptic to bifurcated shape transitions is discussed.

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