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**Magnetic control of breakup of ferrofluid droplets in simple shear flows** MD RIFAT HASSAN, CHENG WANG, Missouri University of Science Technology — Dispersion of droplets is prevalent in a number of industrial applications that utilize highly concentrated emulsions where the morphology of droplets plays a vital role in determining the physical and rheological properties of emulsions. Here, we use numerical simulations to analyze the breakup phenomenon of a ferrofluid droplet under uniform magnetic fields in the Stokes flow limit (Re $\leq 0.03$). Our numerical results demonstrate that application of a uniform magnetic field along $\alpha$ = 45and 90promotes breakup in a ferrofluid droplet at low capillary numbers where the droplet does not typically experience breakup in a shear flow alone. In contrast, implementation of magnetic field along $\alpha = 0$and 135suppresses breakup. A critical magnetic Bond number $Bo_{cr}$ prevails below which no breakup phenomenon is observed, which also depends on the magnetic field directions and decreases for more viscous droplets. Moreover, large number of satellite droplets are observed at higher magnitudes of magnetic field strengths and viscosity ratios.

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