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Bubble Chains in Magnetic Fluids (Ferrofluids) JONG(JAMES) YOO[1], PHILIP YECKO, Montclair State University, WAH-KEAT LEE, Advanced Photon Source - Argonne National Laboratory — Direct numerical simulations are applied to the problem of dynamics of chain formation among small bubbles in a magnetic liquid (ferrofluid), coalescing at low Reynolds number due to magnetophoresis. Complementary experiments performed using high-intensity high-resolution X-ray images of air bubbles in ferrofluid have revealed that linear chains of several small bubbles are extremely common. In numerous applications of ferrofluids, the wanted or unwanted presence of bubbles and bubble chains in particular, is crucial to describing and predicting critical flow properties. In this study we examine the chain formation process between two and three identical bubbles, finding regimes of conditions within which chain formation is expected under a uniform applied magnetic field. We conjecture how these results can be extended to larger numbers of bubbles forming longer chains. Added mass plays a significant role in the magnetophoresis-driven dynamics. We therefore examine the role of the density ratio in the coalescence process among bubbles within the limits imposed by the volume of fluid (VOF) method that we use.

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