Abstract Submitted
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Non-Newtonian behavior of magnetized ferrofluids as revealed by high speed x-ray phase contrast imaging[1] JOY A. PRESCOD, A. CALI, S. NUNEZ, R. SMITH, M. VIEIRA, A.D. TRUBATCH, P. YECKO, Montclair State University, Montclair NJ 07043, W.-K. LEE, Advanced Photon Source, Argonne National Laboratory — Objects moving through a magnetized ferrofluid experience enhanced drag as a result of the presence of magnetic particles and magnetic particle agglomerations which form due to magnetic attractive forces. The precise impact of an agglomeration on an object depends on the characteristics of the agglomeration, the relative sizes of the object and agglomeration, as well as other control parameters. In this study, high speed phase contrast imaging was used to directly image the impact of long thread-like magnetic particle agglomerations on the rheological properties of ferrofluids. Particularly, numerous types of interactions between these threads and translating objects, including free-falling 500 micron sized solid glass spheres and intermittently rising vapor bubbles were quantified. At these scales, objects may bind to particle threads resulting in momentary re-direction or arrest of the object's trajectory, alluding to a form of yield stress. Therefore, there is a macro-viscosity property in flows of this type, which has a potentially significant impact of the use of ferrofluids in micro-fluidics and drug delivery.

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