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Magnetic water-in-water droplet microfluidics MARYAM NAVI, Graduate Program in Biomedical Engineering, Ryerson University, Toronto, Canada, NIKI ABBASI, SCOTT S. H. TSAI, Department of Mechanical Engineering, Ryerson University, Toronto, Canada — Aqueous two-phase systems (ATPS) have shown to be ideal candidates for replacing the conventional water-oil systems used in droplet microfluidics. We use an ATPS of Polyethylene Glycol (PEG) and Dextran (DEX) for microfluidic generation of magnetic water-in-water droplets. As ferrofluid partitions to DEX phase, there is no significant diffusion of ferrofluid at the interface of the droplets, rendering generation of magnetic DEX droplets in a non-magnetic continuous phase of PEG possible. In this system, both phases are water-based and highly biocompatible. We microfluidically generate magnetic DEX droplets at a flow-focusing junction in a jetting regime. We sort the droplets based on their size by placing a permanent magnet downstream of the droplet generation region, and show that the deflection of droplets is in good agreement with a mathematical model. We also show that the magnetic DEX droplets can be stabilized by lysozyme and be used for separation of single cell containing water-in-water droplets. This system of magnetic water-in-water droplet manipulation may find biomedical applications such as single-cell studies and drug delivery.

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