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Microfluidic generation of particle-stabilized water-in-water emulsions NIKI ABBASI, Department of Mechanical and Industrial Engineering, Ryerson University, Toronto, Canada. , MARYAM NAVI, Graduate Program in Biomedical Engineering, Ryerson University, Toronto, Canada, SCOTT S. H. TSAI, Department of Mechanical and Industrial Engineering, Ryerson University, Toronto, Canada — We present a microfluidic platform that generates particle-stabilized water-in-water emulsions, using an aqueous two-phase system (ATPS) of polyethylene glycol (PEG) and Dextran (DEX). DEX droplets are generated passively at a flow focusing junction, in a continuous phase of PEG and carboxylated particles, using weak hydrostatic pressure to drive the flow. As DEX droplets travel inside the microfluidic device, carboxylated particles partition to the interface of the droplets. The number of particles partitioning to the interface of droplets increases as the droplets migrate downstream in the microchannel. As a result, the DEX droplets become stabilized against coalescence. We study the coverage and stability of the DEX droplets further downstream inside a reservoir, by changing the carboxylated particle concentration and the particle size. We anticipate that particle-stabilized water-in-water emulsions may have important biotechnological applications, due to their intrinsic biocompatibility compared to traditional particle-stabilized water-in-oil emulsions, for example for cell encapsulation.

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