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Electronic Supporting information

Stabilization mechanism of double emulsions made by microfluidics

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5 Movie descriptions

The videos described below complement the results shown in the main manuscript

Movie S1.mov

10 Coalescence of droplets of water with 2wt% Tween 20 dispersed in a toluene continuous phase containing 5wt% SiO₂ particles as they travel along the collecting capillary of the microfluidic device.

15 Movie S2.mov

Shrinkage-induced formation of interfacial film on the surface of toluene droplets loaded with 5wt% silica particles dispersed in a continuous phase containing 2wt% PVA.

20 Movie S3.mov

Cyclic expansion and shrinkage of a buoyant drop of toluene loaded with 5wt% of silica particles in contact with a continuous aqueous phase containing 2wt% SDS.

25 Movie S4.mov

Cyclic expansion and shrinkage of a buoyant drop of toluene loaded with 5wt% of silica particles in contact with a continuous aqueous phase containing 2wt% PVA.

30 Additional experiments with single emulsions

Besides the toluene-in-water emulsions with 2wt% PEO-PPO copolymer shown in Figure 3c (main text), we also prepared the inverted water-in-toluene system to evaluate if the expected for-

mation of an interfacial film would also lead to stable emulsions in this inverted configuration. The results shown in Figure S1 confirm that single emulsions consisting of water droplets with PVA or PPO-PEO dispersed in a continuous oil phase loaded with silica particles are indeed very stable against coalescence. Instead, water-in-toluene single emulsions with SDS or Tween 20 in the innermost water phase were found to be unstable. As the interfacial rheology data suggests, SDS and Tween 20 do not form a film at the interface that is sufficiently stable and strong to prevent droplet coalescence. Moreover, the very high Hydrophile-Lipophile Balance (HLB > 16) of these surfactants makes them suitable for the stabilization of oil-in-water emulsions, but not the inverse case.

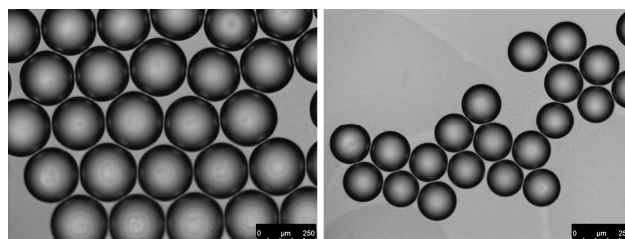


Figure S1. Single emulsions consisting of water droplets dispersed in a continuous toluene phase loaded with 5wt% of 250 nm SiO₂ particles. 60 The water phase contains 2 wt% PVA (left) and 2wt% PEO-PPO (right).

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