

Microfluidic Fabrication of Biocompatible Polymer Microparticles

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Droplet microfluidics offers exquisite control over the flows of multiple fluids and, therefore, a way to fabricate microparticles with precisely tunable structures and compositions in a high throughput manner. These microparticles have great potential in a wide range of bio-related applications including drug delivery and artificial cells. In this talk, we utilize the molecular weight dependent solubility of poly(ethylene glycol) diacrylate (PEGDA) to achieve direct encapsulation of hydrophilic actives in PEG-based microcapsules. By using PEGDA250 as the middle phase in double emulsion drops, we demonstrate that these emulsion-templated microcapsules allow encapsulation of both hydrophilic and hydrophobic cargoes as well as proteins. In the second part of the talk, aqueous two phase system (ATPS) and multiple emulsion drops are synergistically combined to prepare functional materials that otherwise would have been inaccessible. We show that by utilizing triple emulsion drops with multiple compartments, monodisperse water-in-water-in-water double emulsions comprising of ATPS as well as PEG/dextran ATPS-based polymersomes can be produced in a simple and in a controllable manner.