

Formation of multiple emulsion droplets in micromolds via surface tension and polymer fluid phase separation

정성근, 이창수[†], 최윤¹, 남진오, 최창형¹충남대학교; ¹대구한의대학교(rhadam@cnu.ac.kr[†])

This paper presents a simple and rapid method to manipulate multiple emulsion droplets in micromolds utilizing the phase separation of fluids and droplet formation by surface tension. We used a cross-shaped micro-mold containing a prepolymer solution in which the phase is separated into two compartments when the wetting liquid containing a separating agent (SA) is added. As a result, Laplace pressure driven flow creates double emulsion droplets. The size of each compartment of emulsion is controlled to produce double emulsion with varying shell thickness by adjusting the composition of the prepolymer solution and SA. The phase separation creates two compartments with different polarities, allowing hydrophilic/hydrophobic cargo to be encapsulated in the desired compartment. In addition, we produce poly(*N*-isopropylacrylamide) (pNIPAm) hydrogel microcapsules by solidifying the middle phase in the double emulsion. Thus, hydrophilic cargo preloaded in the core can be encapsulated within a hydrogel shell. Finally, we successfully achieve encapsulation of small cargo via post-loading approach by taking advantage of hydrophilic-hydrophobic phase transition behavior of pNIPAm.