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Formation of complex emulsion in microfluidic channel CHANG-HYUNG CHOI, JONGMIN KIM, CHANG-SOO LEE, Chungnam National University — We first report a novel emulsification method using two binary mixtures that produces complex emulsion by phase separation, triggered by external diffusion of separation agent dissolved in continuous phase. A disperse phase consists of monomer and D-solvent (good solvent for disperse phase), while mixture of separation-triggering agent (SA) and C-solvent (good solvent for continuous phase) is used as a continuous phase. Individual droplet was formed by microfluidic system, allowing how the separation dynamically occurs as a function of time. This system consists of the three major steps involving the transformation of a single droplet into the complex emulsion. In the first, when two immiscible phases meet at cross-junction, droplets are generated and dispersed in continuous phase containing the SA. Since the SA is only selectively soluble in the monomer of disperse phase, external diffusion of SA into the droplets through the interface occurs which initiates phase separation. In transient state, the external diffusion of the SA generates both partial separated region and SA/monomer complex at the near interface of partial separated region. In the last step, where the phase separation fully occurs, single droplets transform into complex emulsion such as double emulsion or multiple emulsion with high order. In addition, we demonstrate a capability for generation of complex emulsions gives a great opportunity to fabricate functional materials using template synthesis.

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