

PHYSICAL CHEMISTRY & FORMULATION

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Novel microcapsules for sustained or triggered release

We have developed a novel microcapsule that contains a tortuous structure of two fluids which may be used for triggered or sustained release. We begin with colloidal particles dispersed in the single-fluid phase of a binary solvent system and then quench into the demixed region. To begin with the liquids phase separate through spinodal decomposition and the particles are swept up by the newly created interfaces. Subsequently, the interfacial area decreases as the domains coarsen so that the particle number density on the interface increases until the system jams. Phase separation via nucleation and growth yields particle-coated droplets [1]. By contrast, phase separation via spinodal decomposition yields a bicontinuous fluid structure (aka the bijel [2]) within a microcapsule. The porosity of the internal structure can be controlled through particle volume fraction. We demonstrate that the fluids can be mixed within the capsule or released to the external environment in response to a trigger (e.g. temperature, pH or shear) [3]. We believe these microcapsules.

[1] P.S. Clegg et al., *Langmuir* 23, 5984 (2007) [2] E.M. Herzig et al., *Nat. Mater.* 6, 966 (2007) [3] J. Tavecchia et al., *Advanced Functional Materials*, 21, 2020 (2011)