

Multi-compartment encapsulation of communicating droplets in hydrogel as a model for artificial cells

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Constructing a cell mimic is a major challenge posed by synthetic biologists. Efforts to this end have been primarily focused on lipid- and polymer-encapsulated containers, liposomes and polymersomes, respectively. Here, we introduce a multi-compartment, nested system comprising aqueous droplets stabilized in an oil/lipid mixture, all encapsulated in hydrogel. Functional capabilities (electrical and chemical communication) were imparted by protein nanopores spanning the lipid bilayer formed at the interface of the encapsulated aqueous droplets and the encasing hydrogel. Crucially, the compartmentalization enabled the formation of two adjoining lipid bilayers in a controlled manner, a requirement for the realization of a functional protocell or prototissue.