

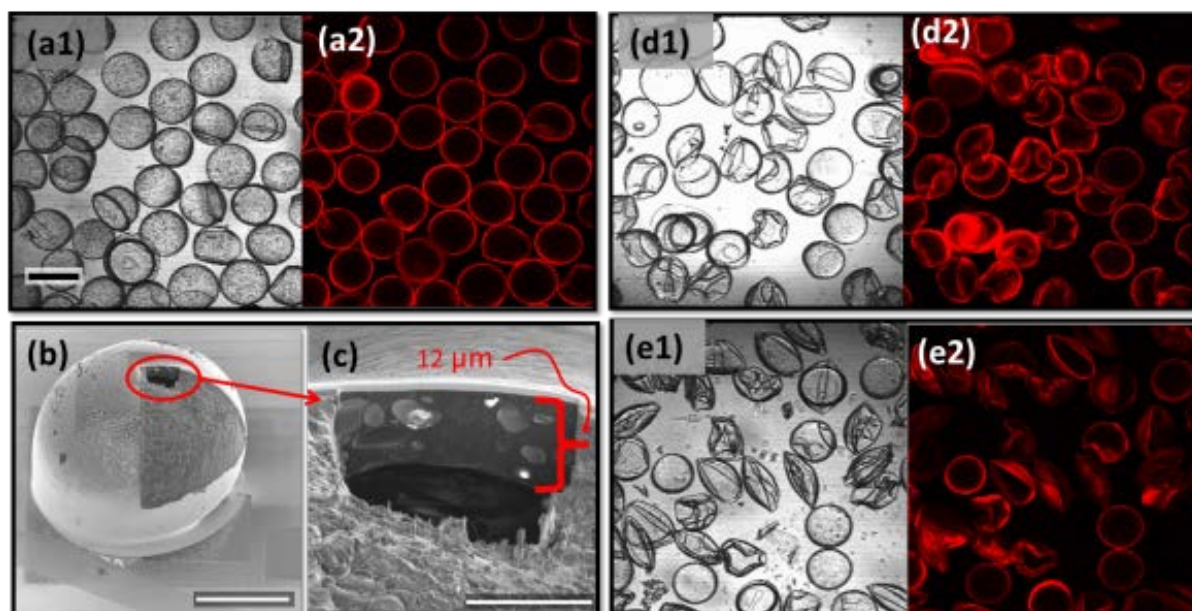
## Novel Microfluidic Strategies for Production of Core-Shell Microparticles with Ultra-Thin Shells and Crescent Microparticles

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Monodispersed biodegradable polymeric core-shell and crescent microparticles have been successfully produced using microfluidic routes. With the co-flow/flow focussing devices, shell thickness, the number of internal cavities, the outer shell diameter and the production rate of the droplets were precisely adjusted by manipulating the flow rate ratio of fluid streams in the device, the evaporation rate and the storage conditions of droplets.

Core-shell particles with ultra-thin shells were generated with 96% water entrapment efficiency by solvent evaporation from the shells of core-shell droplets. Multi-compartment particles were created from multi-cored double emulsion droplets under hydrodynamic conditions that favour dripping of the inner fluid and jetting of the middle fluid. Crescent particles were produced by varying the storage conditions of the resultant shrunk or swollen core-shell particles. The particle morphology was investigated by confocal laser scanning microscopy (CLSM) using the fluorescence dye Nile Red.

Core-shell microparticles with ultra-thin shells were used as ‘microballoons’ for long-term stable micro-organism storage via its semi-permeable shell. Crescent microparticles can serve as Pickering emulsion medium and nano-wells for single cell organisms.



**Figure 1** (a) CLSM images of core-shell particles: (a1) Optical images; (a2) PMT2 images (emission above 570 nm). (b and c) FIB images of a core-shell particles: (b) whole core-shell particle, (c) Cross-sectioned thin wall portion. (d and e) Confocal images of shrank particles after (d) 2 days (e) 14 days of storage. (d1) and (e1) show optical images while (d2) and (e2) show PMT2 images (emission above 570 nm). Red coloration of particles is because of stains from Nile red dye. Scale bars: (a1, a2) 250  $\mu\text{m}$ ; (b) 100  $\mu\text{m}$ ; (c) 20  $\mu\text{m}$ .

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