pH-RESPONSIVE HOLLOW PARTICLES PREPARED BY CO-SOLVENT ASSISTED SOLVENT EVAPORATION: FROM DISPERSIONS TO GEL COMPOSITES

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Stimulus responsive microcapsules attract considerable interest in the polymer science and biomaterials communities because of the varied applications they can provide. At Manchester we developed a cosolvent assisted solvent evaporation approach to prepare pH-responsive hollow particles (Fig. 1a – c). A cosolvent blend was used to dissolve the linear pH-responsive copolymer and subsequent emulsification resulted in hollow particle formation. The morphology of the hollow particles was strongly dependent on copolymer composition[1] and morphologies that mimicked red blood cells could be produced. The relationships between linear copolymer composition and hollow particle morphology are discussed. Concentrated hollow particle dispersions could form injectable physical gels when the pH was increased (Fig. 1d) and gels could be prepared that were redox degradable[2]. The gels could also be converted into covalently inter-linked hollow particle gels (Fig. 1e) that were also pH-responsive. The hollow particles were well suited to gel composite formation (Fig. 1f) and the mechanical properties of these systems could be varied by including shell-crosslinking[3] which was found to strongly affect their pH-responsive behaviours. The potential for application of these scalable systems is discussed.

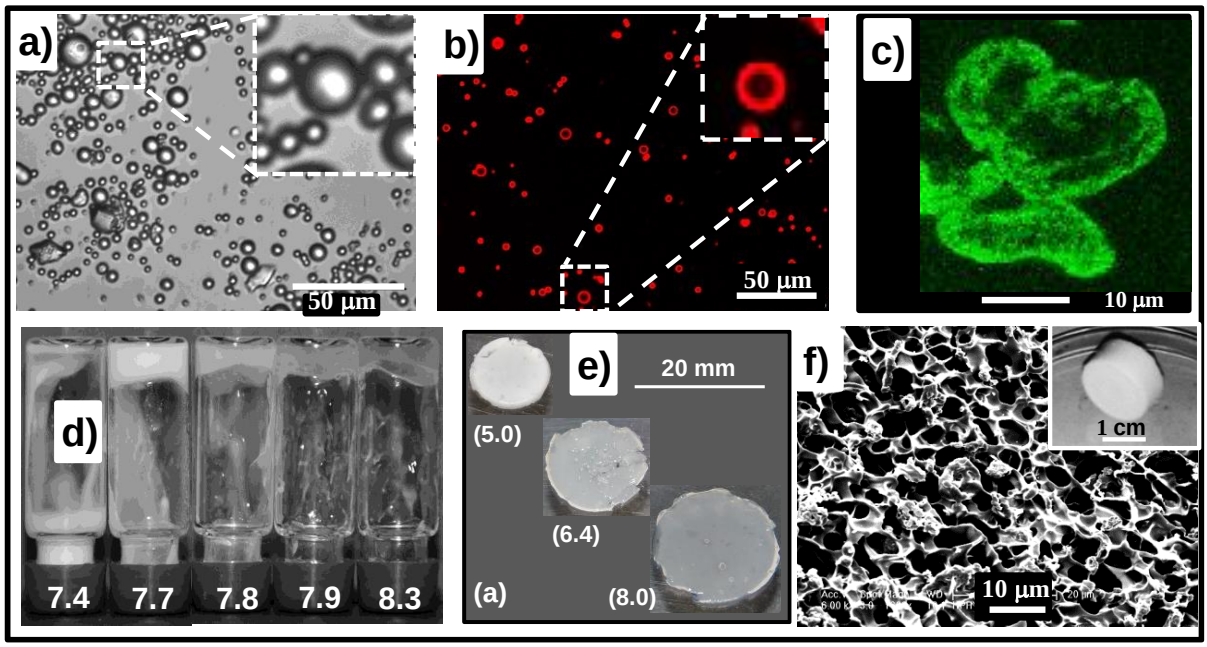

Figure 1 Morphologies of pH-responsive hollow particles (a – c), hollow particle physical gels (d), covalently inter-linked hollow particle gels (e) and hollow particle gel composites (f).

[1] Bird et al., *Soft Matter*, 8, 1047, 2012.
[2] Halacheva et al., *Biomacromolecules*, 15, 1814, 2014.
[3] Pafiti et al., *Soft Matter*, 12, 1116, 2016.