Photopatterned Multidomain Multicomponent Gels

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Whilst there has been significant research into photopatternable gels of low-molecular-weight gelators (LMWGs)[1] and multicomponent gels of two different LMWGs,[2] examples of gels fitting both of these categories are very rare.

We have developed a multicomponent self-assembling system based on two pH-responsive 1,3:2,4-dibenzyldene-D-sorbitol (DBS) derivatives, DBS-CO_2H and DBS-Gly.[3] These two LMWGs have different pK_a values, and as such, their self-assembly is triggered at different pHs. Slowly lowering the pH of a mixture of gelators using glucono-δ-lactone (GdL) initially triggers assembly of DBS-CO_2H, followed by DBS-Gly, with a good degree of kinetic self-sorting being achieved.

Hydrogel formation can also be triggered by using the photoacid generator diphenyliodonium nitrate (DPIN) under UV irradiation. It was therefore possible to use a carefully controlled concentration of GdL to assemble the first network (DBS-CO_2H), following by photoactivation of DPIN to trigger the assembly of the second network (DBS-Gly); in combination with a mask, photopatterned multidomain gels are formed (Fig. 1). This is an innovative approach to spatially-resolved multidomain multicomponent gels based on programmable LMWGs, with one network being positively 'written' into another.

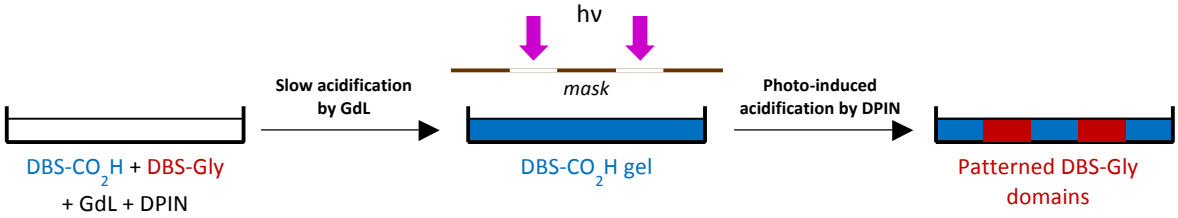

Figure 1. Fabrication of patterned multidomain gels by two-step acidification process.

1 For examples, see: (a) S. Matsumoto, S. Yamaguchi, S. Ueno, H. Komatsu, M. Ikeda, K. Ishizuka, Y. Iko, K. V Tabata, H. Aoki, S. Ito, H. Noji and I. Hamachi, *Chem. Eur. J.*, 2008, **14**, 3977–86; (b) C. Maity, W. E. Hendriksen, J. H. van Esch and R. Eelkema, *Angew. Chemie*, 2015, **127**, 1012–1015.
2 L. E. Buerkle and S. J. Rowan, *Chem. Soc. Rev.*, 2012, **41**, 6089–6102.
3 D. J. Cornwell, O. J. Daubney and D. K. Smith, *J. Am. Chem. Soc.*, 2015, **137**, 15486–15492.