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Enzyme-Inspired Gel Materials: Tuneable Gels for Hydroformylation

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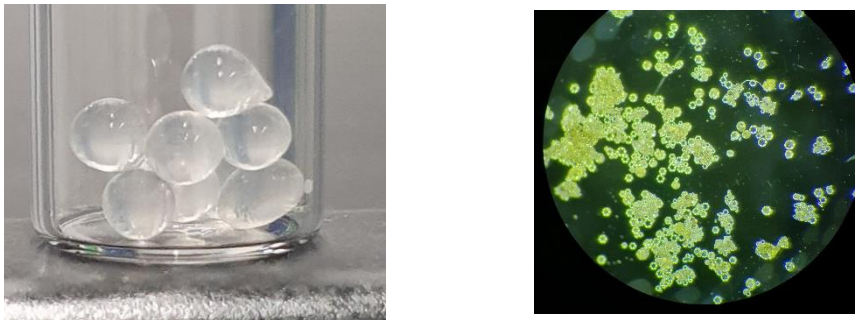
Abstract

In nature, many reactions are performed by multiple enzymes, and therefore multiple active sites working in tandem.[1] Gel materials consist of a solid matrix with a liquid phase dispersed throughout it. The solid matrix can be polymer, molecular, or colloidal, while the liquid phase can be organic (organogel), aqueous (hydrogel) or ionic liquid (ionic liquid gel). Both components can be selected to form a designer material. Furthermore, metal catalysts can be entrapped within gels, which can enhance their activity and facilitate their reuse.[2,3]

We present the synthesis of novel gels, with entrapped metal catalysts (See Figure). We vary the solid and liquid phases, as well as the entrapped metal catalyst, building functionality into each component of the material. This allows the active site of the gels, along with their morphology, to be tailored for a specific reaction, or multiple reactions, thereby mimicking enzymatic processes. The gels show promising activity for hydroformylation reactions.



Examples of different catalyst gels prepared in this work.

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2 Craythorne, S. J.; Anderson, K.; Lorenzini, F.; McCausland, C.; Smith, E. F.; Licence, P.; Marr, A. C.; Marr, P. C. The Co-Entrapment of a Homogeneous Catalyst and an Ionic Liquid by a Sol–gel Method: Recyclable Ionogel Hydrogenation Catalysts. *Chem. Eur. J.* **2009**, *15*, 7094-7100.

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