

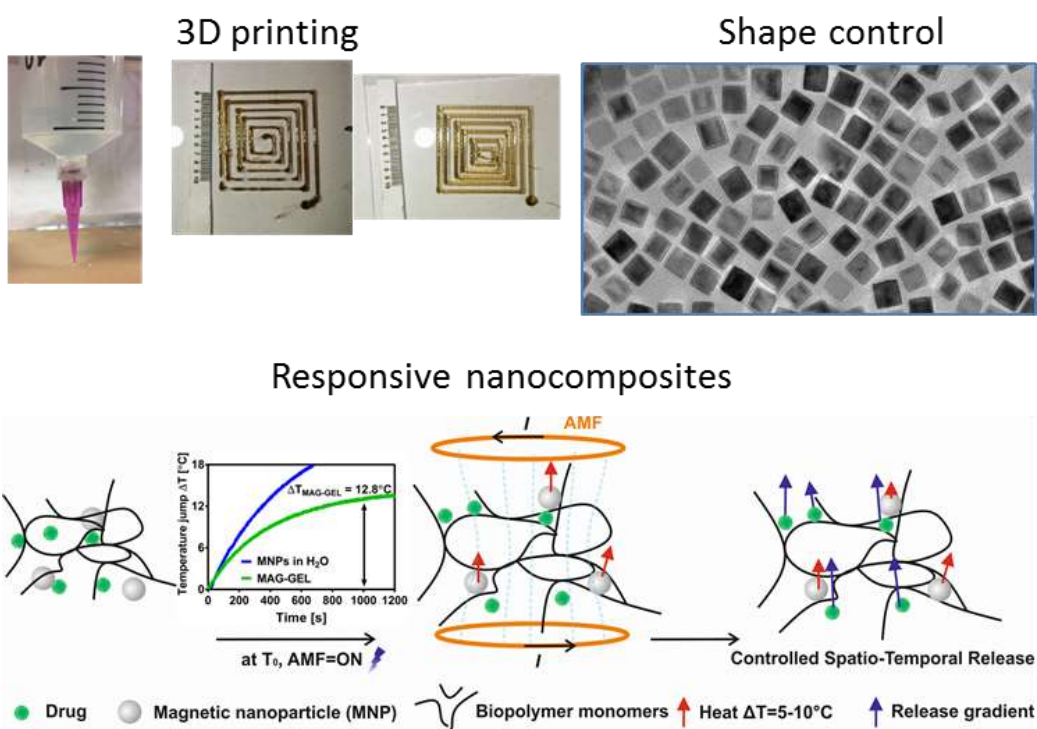
**Ph.D. Opportunity from September 2019**  
**NMR and Nanomaterials Group**  
**Assoc. Prof. Dermot Brougham**

***Towards Responsive Hydrogels***

Magnetic nanoparticles (MNPs) are used in biomedicine for applications from cancer ablation to MRI imaging.<sup>1</sup>  $\beta$ -sheet forming peptide hydrogels are highly hydrated materials built from amphiphilic polypeptide nanofibers that mimic extracellular matrix.<sup>1</sup> They have been shown to be biocompatible and to have tailorable mechanical, physicochemical and biological properties.<sup>2</sup> They have been used in tissue engineering, cell culture and drug delivery. The aim of this PhD project is to prepare novel responsive magnetic hydrogels, by compositing MNPs with self-assembling  $\beta$ -sheet peptides.

Magnetic  $\beta$ -sheet gels (MPGs) will be a new class of responsive nanocomposite for use in medical devices. They will combine the advantages of  $\beta$ -sheet gels (variable stiffness, charge, printability, synthetically-sourced, GMP-like manufacture) with the potential to be externally addressed; *i.e.* heated, and physically distorted to stimulate cells and release cargo on cue and without direct physical contact (magnetic fields permeate gels and humans), so providing a platform responsive gel. Applications of printed composite gels as cell growth scaffolds with surface texturing (spatial release gradients) will be explored.

The work will involve synthesis and detailed physical characterisation / measurement and is suitable for a motivated graduate chemist with interests in biomedical applications of nanomaterials. Informal inquiries to DB as soon as possible. Applications, including CV and cover letter, should be sent to [dermot.brougham@ucd.ie](mailto:dermot.brougham@ucd.ie) by 23<sup>th</sup> August 2019.



1. Brougham, D. F. et al, Size-Controlled Nanoparticle Clusters of Narrow Size-Polydispersity Formed Using Multiple Particle Types Through Competitive Stabilizer Desorption to a Liquid-Liquid Interface. *Small*, 2018, 14, 1802278. Brougham, D. F. et al, Nanoparticle Clusters: Assembly and Control Over Internal Order, Current Capabilities, and Future Potential. *Advanced Materials*, 2016, 28, 5400. Epoxy ring opening phase transfer as a general route to water dispersible superparamagnetic Fe<sub>3</sub>O<sub>4</sub> nanoparticles and their application as positive MRI contrast agents. D. F. Brougham et al. *Advanced Functional Materials*, 2011, 21, 4769.

2. Saiani, A. et al, Controlling self-assembling peptide hydrogel properties through network topology. *Biomacromolecules* 2017, 18, 826.