Organocatalysis, the catalysis of reactions using small organic molecules, fulfills some ‘green chemistry guidelines’, being catalytic and avoiding the use of endangered metals. Immobilising on a solid-support/polymer bead facilitates recovery and reuse which adds significant ‘greening’ of the chemistry and substantial cost benefit. Unfortunately there are limited examples for the immobilization of organocatalyst and these, more often than not, have drawbacks such when compared to the parent homogeneous catalyst.

**The studentship will address the greening of organocatalysis.**

In a traditional solid-phase approach, maximum resin swelling in the solvent is considered optimal. The reagents, key components of the reaction, are usually disregarded; their solubility in the reaction solvent is often the sole consideration. The swollen resin may partition reagents, giving a low concentration within the resin, the loci of the reaction. In this proposal, we will develop a modified approach by adding a fourth tuneable resin-bound component, the tuning module (Fig 1).

![Figure 1: Schematic of tuneable solid-phase (N-functionalised in this example) immobilised organocatalyst.](image)

The tuning module is designed to optimise resin compatibility with sustainable solvent. The solvent may give excellent results in homogeneous reactions using a chosen catalyst but be less than optimal with a resin-immobilised catalyst. Judicious design of the tuning module will enhance resin-swelling in the sustainable solvent that is optimal for the chemistry.

This project is expected to be of significant commercial interest, especially by the pharmaceuticals sector. Solvents are critical to the chemistry carried out in this sector and are increasingly being banned or heavily restricted as their toxicities become better appreciated. Benzene and carbon tetrachloride are two well-known examples of previously widely used solvents that cannot now be used by the pharmaceuticals sector. The next solvents to be banned will be the polar aprotic amides such as DMF and NMP which are known to be reprotoxic. These solvents are heavily relied upon by the pharmaceuticals sector (for example in solid-phase peptide synthesis), so any work showing that biodegradable and non-toxic cyclic carbonates can be used as replacements for traditional polar aprotic solvents will be of significant interest. The project may give the student opportunities to interact /collaborate with interested industry.

**Training at York:** The project is multi-disciplinary and will provide excellent student training as it involves a wide range of techniques (synthetic and analytical) across organic and sustainable chemistry. The students will gain a thorough knowledge/understanding of Green chemical principals and will be able to apply these. In addition, the student will participate in the chemistry department’s Doctoral Training Centre (iDTC). They will take a selection of suitable training courses, which, depending on their background will complement lab-based training. The student will be provided with a number of other opportunities to network and present their work as a poster or oral presentation both within and external to the Department. The student will be encouraged to attend at least one major international conference during their PhD.

**Application closing date:** 17:00 on 11 January 2017

**Interview date:** 15 February 2017

**Funding source:** EPSRC or Department of Chemistry

**Funding Types:** Competition

**Eligibility:** UK

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The Department of Chemistry holds an Athena SWAN Gold Award and is committed to supporting equality and diversity for all staff and students.