OXFORD INTERDISCIPLINARY BIOSCIENCE
Doctoral Training Partnership

Industrial CASE Studentship Advertisement – 2021-22

Supervisor(s) names:	Dr Tim Sudmeier (he/him) Prof Kylie Vincent (she/her) Dr Nikolay Cherkasov
Department(s)/ Organisations:	Department of Chemistry, University of Oxford Stoli Catalyst Ltd.
e-mail:	tim.sudmeier@chem.ox.ac.uk; kylie.vincent@chem.ox.ac.uk
Tel:	01865 282611

Project Title:	*Novel flow devices and development of process automation for H_2-driven biocatalysis*

Brief description of project:

This project brings biocatalysis into Stoli's commercial flow reactors using innovative supported biocatalyst cascades, as well as cutting-edge automation techniques, and in-line monitoring.

Catalysis is essential in the manufacture of pharmaceuticals and speciality chemicals, and enzymes are the catalysts of choice for many chemical steps where selectivity is critical. There are increasing trends towards use of heterogeneous (solid) catalysts in flow reactors, but there are few established methods for translating biocatalysis into flow systems. Environmental and economic benefits of working in flow include lower capital expenditure due to small reactor footprint, higher productivity, and simpler recovery and re-use of catalysts, and combination of multiple reaction steps into one reactor. Flow chemistry is particularly attractive for hydrogenation reactions (selective addition of H_2 to chemicals) since flammable H_2 gas can be handled more safely in flow due to the low reactor volume. Stoli is one of the key players in continuous flow hydrogenation.

The Vincent group have developed novel heterogeneous bio- and chemo-bio- catalyst systems for precise, H_2-powered chemical synthesis, and already have proof-of-concept results highlighting flow chemistry as an excellent technique for implementing these catalysts. However, challenges remain in understanding and optimising these promising systems. This project aims to combine skills from Oxford and Stoli to develop techniques for in-line monitoring to aid process development of the biocatalyst systems in flow. Biocatalysts used in the project will include alcohol dehydrogenases, ene reductases and reductive aminases, together with the Vincent group's novel H_2-driven NADH recycling enzyme systems which supply these enzymes with their cofactor, NADH.

The student will receive training in the Vincent group (in the Department of Chemistry in Oxford) in enzyme handling, immobilisation and characterisation methods as well as in heterogeneous biocatalysis methods and flow chemistry. The student will receive basic training in molecular biology and enzyme isolation. They will be trained in analytical methods including UV-vis spectroscopy, chiral-HPLC, GC, NMR and mass spectrometry.

OXFORD INTERDISCIPLINARY BIOSCIENCE
Doctoral Training Partnership

Industrial CASE Studentship Advertisement – 2021-22

During their placement at Stoli Catalyst Ltd. (Wellesbourne Campus in Warwick), the student will be trained in performing hydrogenation experiments in industrial-grade flow reactors. The student will learn how to automate the experimental processes and develop online feedback process self-optimisation routines. At the later stages of the project, the student will also be able to use scale-up facilities.

Attributes of suitable applicants:

- Undergraduate degree background in chemical engineering, chemistry, biotechnology or biochemistry preferred
- Interest in organic synthesis, pharmaceutical chemistry and/or biocatalysis and biotechnology
- Interest in a collaborative, industry-facing project
- Confident communicator (in written and oral formats)

Funding notes:

This project is funded for four years by the Biotechnology and Biological Sciences Research Council UKRI-BBSRC. UKRI-BBSRC eligibility criteria apply (https://www.ukri.org/files/funding/ukri-training-grant-terms-and-conditions-guidance-pdf/). Successful students will receive a stipend of no less than the standard UKRI stipend rate, currently set at £15,285 per year, which will usually be supplemented by the industrial partner

This project is supported through the Oxford Interdisciplinary Bioscience Doctoral Training Partnership (DTP) studentship programme. The student recruited to this project will join a cohort of students enrolled in the DTP's interdisciplinary training programme, and will participate in the training and networking opportunities available through the DTP. For further details, please visit www.biodtp.ox.ac.uk. The DTP and its associated partner organisations aim to create a community that is innovative, inclusive and collaborative, in which everyone feels valued, respected, and supported, and we encourage applications from a diverse range of qualified applicants.