

Application of non-thermal plasma-assisted heterogeneous catalysis for the non-oxidative coupling of methane

- **Supervisors:** Dr Kechagiopoulos
Prof Anderson
- **Deadline:** Saturday, June 30, 2018



Project Description

In recent years, plasma-catalysis has emerged as a promising technology to improve the performance of existing catalytic processes. The use of non-thermal plasmas in particular has proven effective in enabling catalysts to operate at low temperatures for a range of reactions. In non-thermal plasmas, gas temperature can be as low as environmental, however highly energetic electrons colliding with molecules can produce a variety of species such as free radicals, excited states, ions, and other molecules that can participate in subsequent reactions. As such, there are species in the plasma, available to react on catalyst surfaces, which would typically be observed only at equilibrium systems of much higher temperature. In certain cases even synergistic effects have been experimentally demonstrated, where the performance achieved with plasma-catalysis was higher than the sum of plasma-alone and catalysis-alone.

Focus of the research programme will be on the plasma-catalytic conversion of methane towards higher hydrocarbons via non-oxidative coupling at low temperatures. A combined experimental and computational approach will be followed, with specific research objectives further defined based on the skills, experience and interests of the candidate. The experimental work will utilise a dielectric barrier discharge reactor setup and aim at identifying most promising catalytic materials for the reaction. The modelling work will benefit from an already developed elaborate plasma-chemical kinetic model for methane conversion and will focus on extending the latter to account for catalytic effects. Microkinetic modelling will specifically be utilised to allow the systematic consideration of all elementary reaction processes taking place in the plasma phase and on the catalyst surface and the explicit description of the interactions between them.

The studentship will form part of wider research in our School in the field of plasma-catalysis and will greatly benefit from and also contribute to the efforts of a recently awarded project by the Engineering and Physical Sciences Research Council with closely related activities. The excellent research facilities and world-class expertise will provide a very attractive opportunity for a highly motivated PhD student looking to progress a career in the exciting field of chemical reaction engineering at the interface of plasma science.

The successful candidate should have (or expect to achieve) a minimum of a UK Honours degree at 2.1 or above (or equivalent) in chemical engineering or related discipline and, preferably, have the below skills:

- Knowledge in reaction kinetics analysis and/or kinetic and reactor modelling.
- Experience in the operation of experimental apparatus and/or in the preparation and characterization of catalysts.
- Experience in programming using e.g. FORTRAN or MATLAB.
- Familiarity with methane conversion processes.

The start date for the project is 1 September 2018. The [advert](#) will be removed if a suitable candidate is found before the advertised closing date, so an early application is advised.

Funding Notes

The studentship will provide maintenance costs at Research Council rates and tuition fees at the rate for UK/EU students. In 2018-19 the maintenance grant for full-time students will be £14,777 per annum. International applicants who can pay the difference between the Home and International Fees would also be welcome to apply. The difference between fees will be £14,140 per annum.

Application Procedure

Formal applications can be completed online: <http://www.abdn.ac.uk/postgraduate/apply>. You should apply for Degree of Doctor of Philosophy in Engineering, to ensure that your application is passed to the correct person for processing. During application, note clearly the name of the supervisor and exact project title you wish to be considered for on the application form.

Informal inquiries can be made to Dr P Kechagiopoulos (p.kechagiopoulos@abdn.ac.uk) with a copy of your curriculum vitae and cover letter. All general enquiries should be directed to the Postgraduate Research School (pgrsadmissions@abdn.ac.uk).