Department of Chemistry

PhD Studentship

Dr. Katharina Brinkert

**PhD project:** Photoelectrocatalytic production of ammonia and amines  
**Supervisor:** Dr. Katharina Brinkert  
**Funding availability:** UK Students & EU Students  
**Deadline:** 1st March 2020  
**Proposed Start Date:** October 2020

**Project description:**  
The discovery of industrial scale ammonia synthesis has been a milestone in the history of chemical industry and drastically changed the possibilities for human development: with an annual production of about 140 million tons via the Haber-Bosch process, it is the second largest chemical production worldwide. A large fraction of the population on Earth depends on ammonia as an essential precursor in fertilizer production. The success of the Haber-Bosch process is, however, shaded by its high energy demand: about 1% of the global energy budget is spent on ammonia production and the use of syngas leads to a CO2 release of more than 400 Mt annually, accounting for 1.6% of global CO2 emissions.

This PhD project will exploit photoelectrocatalytic ways of ammonia production utilizing solar energy to drive the electrocatalytic process. New, earth-abundant catalyst materials will be developed by magnetron sputtering and directly deposited on a light-absorbing semiconductor. Electrolyte and the electrocatalyst nanotopography will be optimized with respect to the overall device performance. In a seconds step, surface-activated nitrogen will be used to activate C=C double bonds forming amines which are precursors for chemicals and pharmaceuticals. Photoelectrochemical efficiency studies will be carried out in terrestrial and microgravity conditions to investigate the potential application of the device for fertilizer production in deep space missions.
This 3.5 year PhD studentship is fully funded by the EPSRC and will lead to expertise in manufacturing technologically advanced III-V semiconductors and electrocatalysts, photoelectrocatalysis and the production of solar fuels and chemicals as well designing and building experimental set-ups for experiments in microgravity environments.

Requirements:
Acceptable first degree in Chemistry or a related subject.
The standard minimum entry requirement is 2.1.

Funding:
Funding is available for 3.5 years.
This PhD project is in a competition for a Department of Chemistry funded studentship. Funding is available to UK/EU applicants and comprises home/EU tuition fees and an annual stipend of £15,009 for 3.5 years.

How to apply:
Please direct informal enquiries and requests for further information to Dr. Katharina Brinkert - Katharina.Brinkert@warwick.ac.uk.

Details on the formal application procedure can be found at http://www.go.warwick.ac.uk/pgapply