Imperial College London

Department of Materials

One fully funded 3-year PhD studentship available from October 2015

High-pressure Photoelectron Spectroscopy of Solar Water Splitting Materials

Supervisor: Dr. David Payne

Developing new materials for clean energy applications remains a significant scientific challenge. Designing and fabricating novel materials to split water using sunlight, generating H_2 and O_2, offers a truly renewable route to breaking the dependence on fossil fuels. Metal oxides are considered the most suitable candidate materials due to their stability in aqueous solutions, but unfortunately they typically exhibit large band gaps (<3 eV), and so they only absorb light in the UV region, which constitutes only 5% of the solar spectrum. A key technological goal therefore remains to understand oxide materials, which display smaller band gaps to give, enhanced visible-light driven water splitting efficiencies.

This exciting project aims to characterize oxides for enhanced solar water splitting, based on well-founded materials design principles. Using state-of-the-art photoemission techniques, including the newly commissioned high pressure photoelectron spectroscopy (HiPPES) instrument http://www.imperial.ac.uk/engineering/departments/materials/eqpmt/hippes/ recently funded within the Department of Materials, as well as performing experiments on synchrotron radiation sources in the UK (Diamond Light Source), Europe (e.g. Soleil, Elettra, MAX-LAB, ESRF) and the USA (e.g. ALS & NSLS2), a detailed study of the electronic structure of the oxides will be performed. Experience and expertise in the use of ultra high vacuum (UHV) equipment, and spectroscopic techniques will be developed.

To complement the experimental work, state-of-the-art density functional theory (DFT) calculations with various collaborators, will theoretically examine the surface chemistry of promising materials, as well as open up new avenues in materials design. It is expected that the results from this project will lead to a number of high quality publications, with further opportunities to present the research at national and international conferences.

Applications are invited from students with a relevant background in the physical sciences or engineering. **There is one studentship available**. The minimum academic requirement for admission is an upper second class UK MSci or MEng honours degree. This 3-year studentship, funded by the EPSRC, will begin in October 2015 and will provide full 'home rate' fees plus the standard maintenance stipend to UK and EU students who meet the EPSRC residency criteria. Applications will be processed as received. For questions or further details regarding the project, please contact Dr. David Payne (d.payne@imperial.ac.uk) or see website http://payneresearch.org/. For questions regarding the admissions process, please contact Mrs Fiona Thomson (fiona.thomson@imperial.ac.uk). Formal applications can be completed online: http://www3.imperial.ac.uk/materials/research/phdopportunities while information about the Department can be found at http://www3.imperial.ac.uk/materials.

Applications will be considered from now onwards.

Committed to equality and valuing diversity. We are also an Athena Silver SWAN Award winner and a Stonewall Diversity Champion