

Research Visit to Oak Ridge National Laboratory, Tennessee, USA

18th - 30th July 2011

As a prize winner at the WMRIF 2nd International Workshop for Young Materials Scientists in August 2010, I was given the fantastic opportunity to visit Oak Ridge National Laboratory (ORNL), Tennessee, USA. This institution has a well established facility and extensive expertise in the characterisation of heterogeneous catalysts, a theme that I am currently developing at my own organisation, the National Physical Laboratory (NPL) in the UK. As such, for me this was an ideal place to learn and exchange ideas with the experts during my two-week stay.



I was kindly welcomed into the Surface Science and Catalysis Group, run by Steve Overbury and for the most part worked alongside his postdoc, Daniela Anjos. Coincidentally, the group had just moved into their brand new Chemical Sciences Division building, and so I had the privilege of being one of the first to work in this impressive facility. I also had the pleasure of meeting the director of ORNL, Thom Mason (pictured, left).

The focus of the research visit was to explore the use of combined electrochemical infra-red (EC-IR) spectroscopy to study electrocatalysis on gold nanoparticles. Using IR spectroscopy in the attenuated total reflectance (ATR) mode allows one to look principally at molecules adsorbed at the surface of the electrocatalyst material which can either be coated directly onto the ATR crystal, or can be immobilized onto an electrode and brought into close proximity to this crystal. When combined with electrochemical measurements, this approach enables the study of electrode reaction mechanisms and kinetics. In particular I was interested in investigating the electrocatalytic oxidation of glucose in alkaline solution, which is a field of significant academic and industrial interest. Whilst much of the time was spent optimising the electrochemical cell and learning to control the variability of the spectral response, this was very much an important learning experience for myself and the group members involved. This work will be on-going in the group and we hope to maintain our interaction through future collaboration. Notably, I was introduced to several members of the Centre for Nanophase Materials Science, which has a user facility with a host of relevant techniques that I am hoping to utilise in the future.

In addition to the scientific rewards of this trip I also found it to be a great cultural experience and I had the time to do some travelling and exploring in East Tennessee. I visited Nashville ("Music City") and drove up the Great Smoky Mountains, which boasts

some fantastic views. I was also impressed by the Oak Ridge Museum of Science and Energy, which gives a powerful history of Oak Ridge, "The Secret City".

Whilst I could never acclimatise to the heat and humidity in East Tennessee, I would certainly recommend ORNL as a great place to do excellent science, meet some very friendly and fun people and feel part of something very unique. I am very grateful to the people that made this trip possible, including the award committee at WMRIF for giving me this wonderful and educational opportunity, and Steve Overbury, Daniela Anjos and Thom Mason at ORNL for their support and for generously giving me so much of their time.

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