Dr D. Walsh - Report for JSPS Invitation Fellowship (Long-term) at National Institute for Materials Science, Tsukuba, Ibaraki, Japan

Host: Prof Katsuhiko Ariga-Supermolecules Group and MANA at NIMS February-April 2012

For my JSPS Invitation Fellowship hosted at the Supermolecules Group under the supervision of Prof. Katsuhiko Ariga and Dr Jonathon Hill, I undertook a number of laboratory experiments, set-up several collaborations as well as making presentations of my ongoing research.

XPS measurement of metal oxide nanoparticles

The first collaboration was set-up a Senior Researcher based at the Sakura NIMS site and concerned the XPS measurement of several metal oxide materials used as catalysts for solar fuel production application. XPS is an excellent technique to determine the elemental abundance and oxidation state of the metal ions in the catalyst and XPS measurement of samples is prohibitively expensive and difficult to undertake at Bristol.

XPS measurement of calcium phosphates

A further collaboration concerning the analysis of new calcium phosphate materials, again using XPS analysis was set-up with a member of the MANA foundry and who has access to XPS instrumentation at NIMS MANA.

Preparation of metal oxides for supercapacitance applications

A further and quite major collaboration has been set up within the Supermolecules Group concerning the novel preparation of a number of metal oxides with particular composition and morphology that makes them suitable for supercapacitance applications.

A new synthesis methodology for the preparation chelated nanoparticles was developed in aqueous and solvent preparation systems. These materials are currently further and being tested for supercapacitance and solar fuel production applications. This collaboration will be continued and several joint publications should result.

Simultaneously with this experimental work a number discussions were conducted with members of the Supermolecules Group and other researchers at NIMS Namiki, Sengen and Sakura sites and also with previous collaborators based in Japan at meetings in Tokyo. Presentations of my ongoing research were also made at Symposia in Tsukuba.

These interactions resulted in an exchange of ideas and suggestions for further work were made with a number of researchers at NIMS, several meetings were also held in Tokyo with other potential

collaborators for research in area of applied nanomaterials. Overall the quite short visit of 64 days in length in Tsukuba was highly fruitful and several ongoing collaborations which should lead to several joint publications in leading materials journals have resulted.

Tips for undertaking research

Analytical equipment and even fairly simple apparatus such as furnaces, pH meters etc. are normally in possession of particular researchers or research group, in order to undertake experimental work at institutes in Japan exploration of labs to discover locations and ownership is necessary. Negotiation for collaborative use of equipment, via your supervisor, is usually necessary, with the understanding that all persons involved are included on any publications that may result. Researchers at Japanese institutes typically also work quite individually and it is often the case of providing a sample for analysis by the researcher with the data then provided to you, this can sometimes be a lengthy process.

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Part of NIMS institute during ‘Sakura’ cherry blossom season, April 2012.