PhD Fellowship 1 - Nanoscience

DNA-Directed Nanofabrication

Melbourne - Australia

The project: **DNA-Directed Nanofabrication**

Current micro and nanofabrication methods (e.g. silicon chip production) are based on top-down approaches using photolithographic methods. Alternatively devices can be assembled through bottom-up approaches using nanoscale building blocks of metals, semiconductors and insulators. Inorganic chemistry offers a wide range of techniques to synthesise such nanoparticles with excellent control over their size and shape. Single nanoparticles and even single atoms can be manipulated on surfaces using techniques such as atomic force or surface tunnelling microscopy. However these methods are inherently slow and will never be a viable option for the mass production of nanoscale devices. Our group aims to develop methods that rely on molecular self-recognition to direct the assembly of nanoparticle building blocks to allow the formation of any desired nanostructure. Short synthetic strands of DNA selectively bind to their complementary counterparts through Watson-Crick base-pairing. We will use this highly selective recognition behaviour to direct the assembly of particles to larger functional structures with unique optical, electrical and mechanical properties. Our project will be carried out in collaboration with Professor Paul Alivisatos at the University of California Berkeley as well as the Molecular Foundry at the Lawrence Berkeley National Laboratory (USA).

About us: **Australian Center for Electromaterials Science (ACES)**

The project described above is hosted by a new Center of Excellence (ACES) based at Monash University (Clayton/Melbourne). Additional areas of research interests within the centre are artificial muscles, plastic solar cells and bio fuel cells.

Monash University is Australia's largest university with over 55,000 students on 8 campuses. It was ranked number 33 by the 'Times Higher Education Supplement' in its annual ranking of the world's top 200 universities in 2005. Monash has the leading School of Chemistry in Australia. The country's first synchrotron, located at Clayton campus, will open its doors in 2007.

Melbourne: *Melbourne, with a population of more than three million, is Australia's second largest city. It is regarded as the cultural capital of Australia. It is a true multicultural city with more than one quarter of Melbourne's inhabitants born overseas.*

Your Profile *The candidate should be an Australian or international student with the equivalent of a BSc or Master degree. We are looking for a highly self-motivated individual, eager to widen his/her scientific horizon across the traditional borders of chemistry, physics and biology. We would appreciate if the applicant has experience in any of the following areas: Surface probe microscopy, bioconjugation techniques, surface-immobilization of biomolecules, study of self-assembled monolayers, nanolithography & TEM. We also encourage students to join our group for research stays in the framework of international exchange programs.*

Applications: *Applications including a curriculum vitae and a short statement of research interests can be sent to Dr. Udo Bach:*
udo.bach@sci.monash.edu.au
Application deadline: 1st July 2006

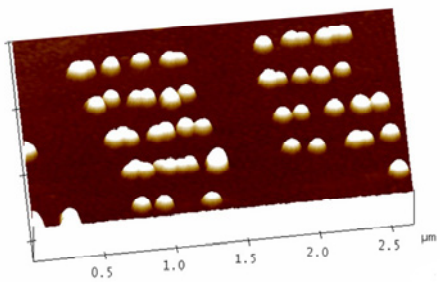

Figure 1. self-assembled lines of gold nanoparticles (30 nm) on a silicon substrate (atomic force microscopic picture)

ARC Center of Excellence for Electromaterials Science

MONASH University

Australian Government
Australian Research Council

PhD Fellowship 2 - Nanoscience

Next-Generation Dye-Sensitised Solar Cells

Melbourne - Australia

The project: **Next-Generation Dye-Sensitised Solar Cells**

Fossil fuels are slowly running out and their major combustion product CO_2 is starting to strongly affect our planets climate. We are therefore in urgent need of alternative energy sources. Solar cells are a viable option to cover our future energy needs. However, to do so, they need to be cheap and efficient. Dye-sensitised solar cells are simple and cheap to manufacture, while showing overall solar energy conversion efficiencies of up to 11%. Our research team at Monash University focuses on novel aspects of dye-sensitised solar cells including multi-junction solar cells, photon up and down-conversion and flexible solar cells. The project will be carried out in collaboration with the group of Professor Michael Grätzel at the Swiss Federal Institute of Technology in Lausanne.

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Melbourne: *Melbourne, with a population of more than three million, is Australia's second largest city. It is regarded as the cultural capital of Australia. It is a true multicultural city with more than one quarter of Melbourne's inhabitants born overseas.*

Your Profile *The candidate should be an Australian or international student with the equivalent of a BSc or Master degree. We are looking for a highly self-motivated individual with a strong interest in the area of renewable energy. We would appreciate if the applicant has some experience in optoelectronics, colloidal chemistry and electrochemistry.*

We also encourage students to join our group for research stays in the framework of international exchange programs.

Applications: *Applications including a curriculum vitae and a short statement of research interests can be sent to Dr. Udo Bach:*
udo.bach@sci.monash.edu.au
Application deadline: 1st July 2006

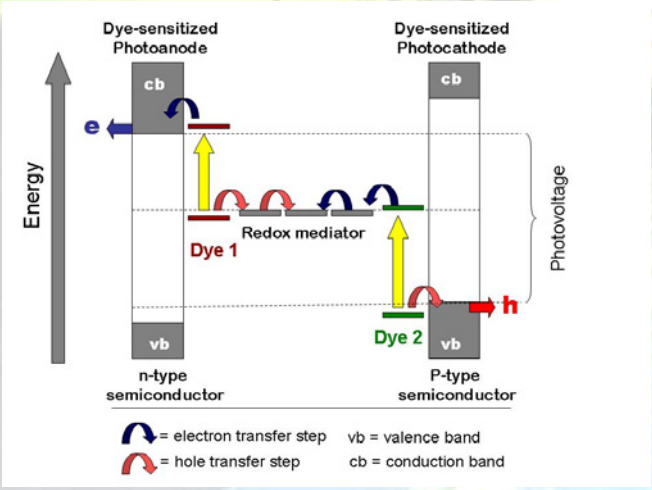

Figure 1: Dye-sensitized tandem solar cell

ARC Center of Excellence for Electromaterials Science
MONASH University
Australian Government
Australian Research Council