

RESEARCH SEMINAR
hosted by
Department of Chemistry & NUSNNI

Can Nanotechnology make synthetic muscles?

Professor Tony Ryan
University of Sheffield

Date: 22 September 2005

Time: 4.30 pm

Venue: Blk S7 Level 3 Rm 13 (SR28)

Motility is a ubiquitous feature of living systems and is driven by the ability to convert chemical energy into mechanical work. Synthetic polyelectrolytes provide a simple analogy to this through the volume change associated with ionisation and this effect was used to build a single stroke "artificial muscle" more than fifty years ago. Macroscopic applications of such stimulus responsive gels are limited, however, because the volume change relies on mass-transport of solvent and is ultimately limited by the gel-response rate. Recent efforts toward synthetic muscles have concentrated on actuation by temperature, light or electric fields. Recognising the fundamental limitation of chemical actuation we have constructed a scalable responsive-gel from a robust, self-assembled block copolymer comprising hydrophobic, glassy end-blocks and a weak polyacid mid-block. The gels deform affinely in response to a pH stimulus with a volume change of 3. When coupled to a chemical oscillator, this provides a free running chemical motor that generates a peak power of 20 mW/kg, by the serial addition of 10nm shape changes, to provide reciprocating macroscopic motion on the mm scale.

ABOUT THE SPEAKER

Professor Tony Ryan is the ICI Professor of Physical Chemistry and EPSRC Senior Media Fellow at the University of Sheffield. Tony presented the Royal Institution Christmas Lectures in 2002, which looked at subjects as diverse as: What do spiders webs and suspension bridges have in common? and What connects the trainers on your feet to a jumbo jet flying 40,000 feet in the air? and were seen by TV audience of 4 million. He is a regular contributor to radio and newspapers and is developing a number of TV opportunities. He was born in Leeds and got his three degrees from UMIST. He is married with two daughters. Tony is a creative cook, a keen cyclist and an occasional mountaineer with a weakness for gadgets. His research covers the synthesis, structure, processing and properties of polymers and he was in at the beginning of polymer nanotechnology. He has coauthored more than 200 papers and 8 patents and written a book on polymer processing or how things are made from plastic.

ALL ARE WELCOME

