

Chemical Technology

Photoswitching



Investigations highlighted in a new review by Robert Lemieux of Queens University, Ontario, have led to a greater understanding of the mechanisms of ferroelectric liquid crystal photoswitching and have revealed further challenges facing researchers in this area.

Rebecca Gillan

R P Lemieux
Soft Matter, 2005, **1**, 348

Assistance for cysteine counters

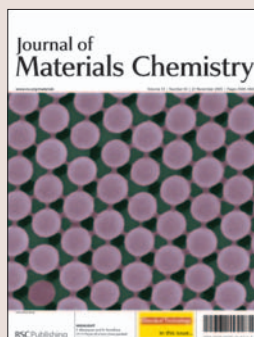


Hubert Girault and colleagues from the Laboratoire d'Electrochimie Physique et Analytique in Lausanne, Switzerland, have developed a new approach to counting the number of cysteine groups in peptides.

Madelaine Chapman

L Dayton, J Josserand and H H Girault
Phys. Chem. Chem. Phys., 2005 (DOI:10.1039/b511334b)

Build a better blue



Franklin Jaramillo-Isaza from the University of Antioquia in Colombia and Michael Turner from the University of Manchester, UK, have collaborated to produce a set of model light-emitting polymers which will help in the design of better blue emitters.

Clare Boothby

F Jaramillo-Isaza and M L Turner
J. Mater. Chem., 2005 (DOI: 10.1039/b511349k)

A structured approach



New research by Jonathan Cooper from the University of Glasgow and colleagues in the UK and Sweden that enables individual bacteria to be positioned at pre-defined locations within a gel matrix may provide insights into the way cells develop and behave.

Kathryn Lees

P Jordan et al
Lab Chip, 2005, **5**, 1224

Application highlights

Nanotechnology, surface modification and magnetism combine

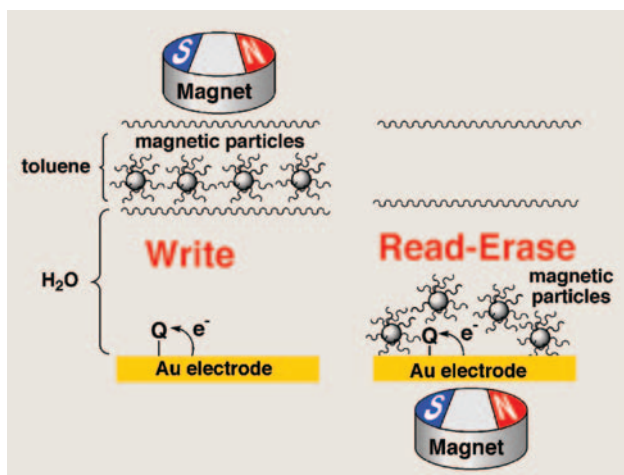
Electrochemical information storage

Scientists in Israel have added a new dimension to information storage systems.

Most information storage devices use light signals to encode information, and optical or electrical stimuli to read it. These can suffer from degradation after repeated illuminations, and thermal loss of the stored information over time.

Itamar Willner and Eugenii Katz at the Hebrew University of Jerusalem have developed a novel electrochemically activated write-read-erase technique, gated by magnetic nanoparticles.

Their system consists of an array of gold electrodes, functionalised with quinone, in conjunction with a two phase aqueous-toluene component. The electrode is initially exposed to the aqueous electrolyte solution while the magnetic nanoparticles are



dispersed in the upper toluene layer. When a magnet is placed below the electrode, the nanoparticles are magnetically transported to the electrode surface. They can then be retracted from the surface simply by

Novel write-read-erase technique involves magnetic nanoparticles

placing the magnet at the top of the electrochemical cell.

Because the particles are hydrophobically modified, they carry with them a small amount of toluene solvent, creating a thin, non-aqueous film on the electrode surface. The quinone modified electrode shows a significantly different electrochemical response in aqueous and non-aqueous environments. It is this difference that the researchers have exploited to develop the write-read-erase method.

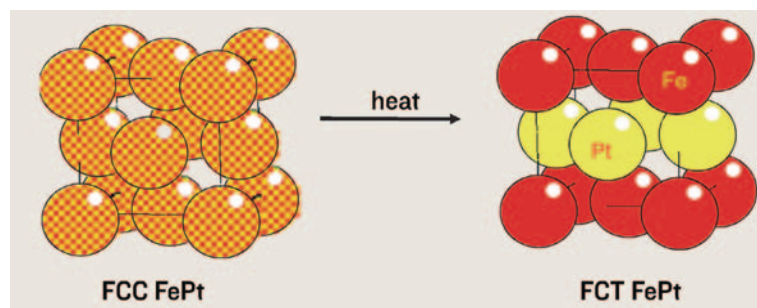
Willner and Katz foresee the future development of this remarkably stable information storage system using multi-electrode micro-chip devices. Nicola Nugent

Reference

E Katz and I Willner, *Chem. Commun.*, 2005, 5641

Nanosized iron-platinum cheats the superparamagnetic limits

Magnetic particles for hard drives



Disordered iron-platinum is converted to the ordered material at 300°C

An interdisciplinary team of chemists, physicists and engineers from the Universities of Durham and Sheffield, UK, has found a way of making nanoparticles with an ordered arrangement of iron and platinum. John Evans and co-workers hope the magnetic particles will find use in computer hard drives.

Up to a point, increasing the information density of a hard drive depends only on the size of the particles: the smaller they

are, the more data can be stored on a given area. However, when particles get too small, they can reach the superparamagnetic limit, where thermal energy is sufficient to randomise the magnetic alignments.

Fortunately for computer users, this limit can be avoided by using materials in which it is very hard to change the direction of the magnetic moment, so that the information is not lost. Iron-platinum is known to keep its

magnetisation direction, but only when the different metal atoms are distributed evenly throughout the particles. The only way to do this in the past has been by heating them to around 600°C, which has the drawback of increasing the particle size.

Evans and his team have been able to make particles of approximately 2nm using microwave heating to the relatively low temperature of 150°C. These are then converted to the crucial ordered material (see graphic) by heating to 300°C without the particles increasing in size.

The method already works for iron-platinum and iron-palladium and the team hopes to extend it to other metals. Evans commented that the fact that this route allowed them to prepare 'FePt nanoparticles directly in solution, exactly as hoped, has been particularly satisfying'. Neil Withers

References

H L Nguyen *et al.*, *J. Mater. Chem.*, 2005 (DOI: 10.1039/b511850f)
L E M Howard *et al.*, *J. Am. Chem. Soc.*, 2005, **127**, 10140

Studying the nutrients in foods



A method for estimating the bioavailability of several essential elements at once from a continuous in vitro digestion system has been developed by researchers in Thailand.

Mineral deficiency is a serious worldwide problem and it can be difficult to know which foods are the best sources of different minerals.

Ideally, assessment of bioavailability of nutrients from different foodstuffs should be carried out via in vivo studies using human volunteers. However these studies are expensive, time consuming, difficult and unreliable.

In vitro method for testing bioavailability mimics the human digestive system

Reference
K Judprasong *et al*, *J. Anal. At. Spectrom.*, 2005, **20**, 1191

In vitro methods estimate bioavailability by using a simulated enzymatic digestion of food and measuring the ability of nutrients to pass through a semi-permeable membrane. These methods are simple, fast and cheap but need to be carefully optimised to make them as similar as possible to in vivo studies.

Juwadee Shiowatana's group at Mahidol University in Bangkok used inductively coupled plasma optical emission spectrometry (ICP-OES) coupled on-line to the simulated digestion system allowing rapid determination of a range of nutritionally important elements.

The in vitro apparatus developed by the group mimics the absorption of food in the human digestive system more closely than previous methods. Coupling the system with ICP-OES allows much more rapid assessment of mineral bioavailability as several elements can be measured in the same analytical run.

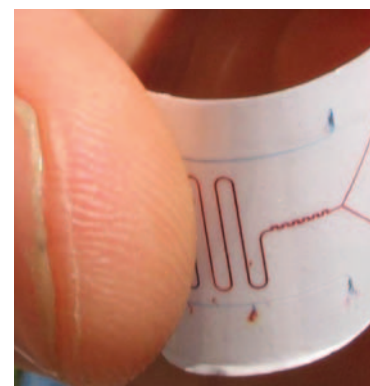
In the future they hope to apply the system to evaluate a wide range of foods to reduce the health risk from mineral deficiency.

Christopher Ingle

Making thin porous chips

Rob Lammertink and colleagues at the University of Twente in Enschede, the Netherlands, have developed a new replication method to make thin porous chips.

The new technique is based on phase separation micro moulding (PS μ M). The phase separation and precipitation of a polymer solution onto a microstructured mould forms a film that replicates the structure of the mould. It is the characteristics of the film that essentially define the structure of the microfluidic channel in the chip.



The porosity of the film can be tuned by controlling the conditions of the phase separation process.

Introducing porosity into the chip enables the selective transport of chemicals in and out of the channel. It is exploiting this principle that will open up new possibilities for on-chip integration of chip functionalities.

In addition to producing porous, flexible microfluidic chips, the technique offers other advantages such as the possibility of using many different materials. The process is also simple and cheap.

The group believes its technology will be used particularly for single-use applications, but given the possibilities of preparing chips with potentially very different porosities, the applications could be wide ranging. 'We have only just started exploring some of them,' said Lammertink.

Katherine Davies

Reference
J de Jong *et al*, *Lab Chip*, 2005, **5**, 1240

New films advance display technology

New electrochromic thin films that show promising potential for use in high performance displays have been developed by Chinese researchers.

Jun Peng and colleagues from Northeast Normal University have made molybdenum-doped hexagonal tungsten bronze (Mo-HTB) multi-layer films that change colour from white to light blue and finally to dark blue when controlled by an electric signal.

The Mo-HTB films are made using a simple layer-by-layer assembly of polyethyleneimine, a colourless conjugated polymer, and a nanoparticle dispersion of Mo-HTB.

The ability of molybdenum and tungsten to lose or accept electrons easily and reversibly leads to the electrochromic properties of the films. The colour of Mo-HTB changes according to the



Electrochromic thin films show potential for use in high performance displays

Reference
B Xue *et al*, *J. Mater. Chem.*, 2005, **15**, 4793

oxidation states of Mo and W and the electrochromic contrast can be adjusted by changing the molar ratio of Mo to W.

The films show improved durability, high contrast, fast switching and colouration efficiency which makes them a key candidate for use in the manufacture of thin film displays.

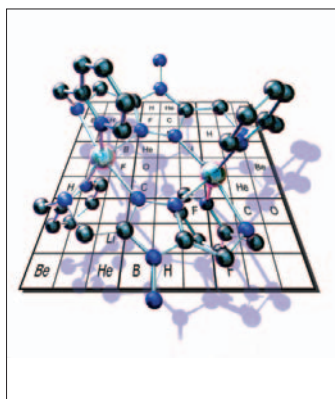
Ruth Needham

Essential elements

Puzzling chemistry

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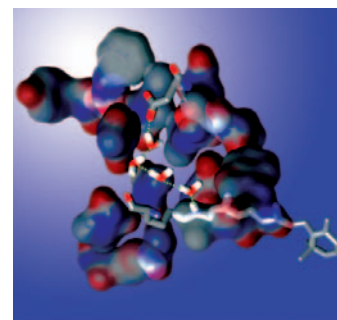
with interesting clues spanning all areas of chemistry whilst the *Chemistry Su Doku* book has been specially developed to incorporate chemical symbols in place of numbers. Themes include the periodic table, the isotopes of boron and John Dalton's notation system from 1808.

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40th anniversary of ChemComm

This year has seen the anniversary of 40 years of *ChemComm*. Launched in 1965 as a new communications journal, *ChemComm* has blossomed into a major weekly publication. Highly regarded, it has an international reputation for publishing cutting edge science. It is not just the quality that is admired, it is also the breadth of coverage and speed of publication that scientists find appealing. Authors like the format of *ChemComm* where they can showcase their research with short reports of innovative work that will reach a wide scientific audience.

To celebrate the 40th anniversary of *ChemComm* a series of Anniversary Lectures were presented by four distinguished chemists; Jonathan Sessler, Mikiko



Sodeoka, Jean Fréchet and Claudio Luchinat. These were presented at a number of conferences during the summer where the scientists all received the 40th Anniversary Lecture Award. This has also been complemented with other events and features through the year including a reception at the

229th ACS National Meeting in San Diego and compilations of the top 40 most cited authors and papers. In addition, several Anniversary Articles discussing high profile subjects in the field have been published, of which one article was written by the newly awarded Nobel Prize Laureate in Chemistry Richard R. Schrock.

Over the years *ChemComm* has shown commitment to publishing high standards of scientific research attaining high impact factors year on year.

2005 has been a significant year for *ChemComm* and its editorial team; one which provides an excellent platform from which to look to the future!

To find out more about *ChemComm* please visit www.rsc.org/chemcomm

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