

Chemical Technology

Reversible optical sensing



The colour change reaction that darkens spectacle lenses in sunlight has now been applied to optical sensing.

Merlin Fox

R J Byrne, S E Stitzel and D Diamond
J. Mater. Chem., 2006 (DOI: 10.1039/b516400a)

Control in crystal engineering

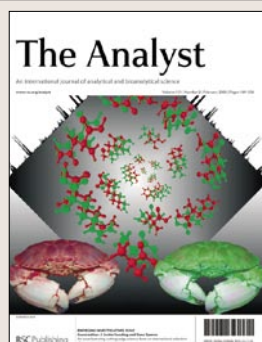


Studying intermolecular interactions opens up a range of possibilities for the design of new materials and drugs.

Richard Kelly

José Giner Planas *et al*
CrystEngComm, 2006, **8**, 75

Quiet optical revolution



A simple method for making an optical temperature sensor from a luminescent polymer film incorporating ruthenium(II) diimine has been developed.

Helen Lunn

A Mills *et al*
Analyst, 2006 (DOI: 10.1039/b516366h)

Bright future for quantum dots?



Nanocomposites have been developed that show high potential for cancer treatment by photodynamic therapy.

Katherine Vickers

J-M Hsieh *et al*
Chem. Commun., 2006, 615

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Application highlights

Analysing paint fragments can be used to find hit-and-run vehicles

Catching the culprits

The forensic analysis of paint fragments can be prone to interference from their complex composition, warn analytical chemists.

Organic ions or compounds such as talc or barite can interfere with the spectral profiles of certain transition metals. 'Neglecting their influence can lead to misinterpretation of the analysis data obtained,' said Frank Vanhaecke, professor of analytical chemistry at Ghent University.

Vanhaecke and colleagues have refined the spectroscopic method used in forensics. They say they can eliminate interference by using a field-based mass spectrometer, which can weed out interfering ions on the basis of their mass-to-charge ratio.

The analysis of small fragments of paint left behind at the scenes of car accidents can be used to match them to a specific vehicle. The forensic



study of the paint includes analysis of the pigment types or additives present as well as its physical nature – colour, thickness, multiple layers, etc. Several techniques are used in forensic analysis, including highly

The forensic method has been refined to weed out interfering ions

sensitive mass spectrometry.

Laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) is used for forensic elemental analysis, with its high resolution and detection range of below parts-per-billion. Major, minor and trace elements can be detected and in this way car paints of the same colour can be discriminated from one another on the basis of elemental composition.

The team, which includes researchers from the Belgian National Institute for Criminology and Criminalistics, has suggested that measuring the ratio of the target elements to titanium (present at high concentrations in most primers) is a first step towards finding hit-and-run culprits.

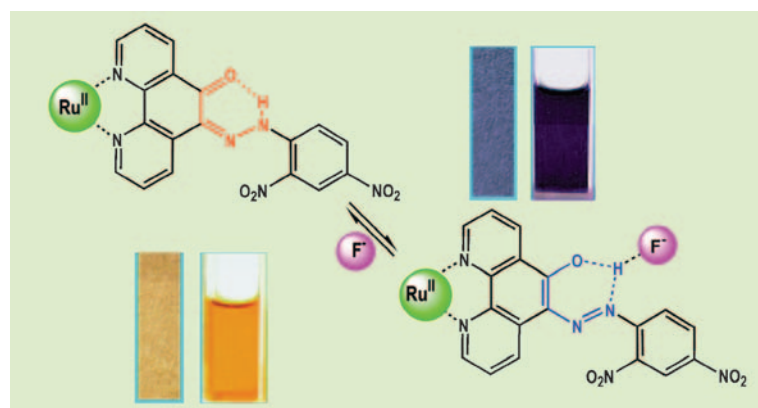
Michael Spencelayh

Reference

I Deconinck *et al*, *J. Anal. At. Spectrom.*, 2006, **21**, 279

A visual sensor could help fight fluorosis in developing countries

Finding fluoride with the naked eye



An effective sensor for the visual detection of fluoride in water has been developed by chemists in China.

Chun-ying Duan, Zhi-ping Bai and colleagues at the State Key Laboratory of Coordination Chemistry in Nanjing have made a ruthenium compound that changes colour from orange to blue-violet

when it bonds to a fluoride anion.

The system contains a photoactive ruthenium bipyridine segment that enhances bonding to the fluoride anion through electrostatic interactions. This provides the dramatic colour change that can be observed by a naked eye.

There is a growing market for

The compound changes from orange to blue when they bond to fluoride

simple and affordable fluoride detection systems. Fluoride has an established role in preventing tooth decay and is currently being explored as a treatment for osteoporosis. However, overexposure can also lead to fluorosis, a type of fluoride toxicity that can lead to pitting of tooth enamel and discolouration and is rare in the UK. Until now, there have been no compounds that provide a measurable output when they bind to fluoride anions.

The sensor can be prepared as a test-paper, similar to pH paper, and no spectroscopic instrumentation is required. It is highly selective and can detect fluoride in aqueous solutions at a lower limit of about 10 ppm.

Duan and Bai hope that this cheap and effective new sensor will prove advantageous in helping to prevent fluorosis in undeveloped regions.

Ruth Needham

Reference

Z H Lin *et al*, *Chem Commun*, 2006, 624

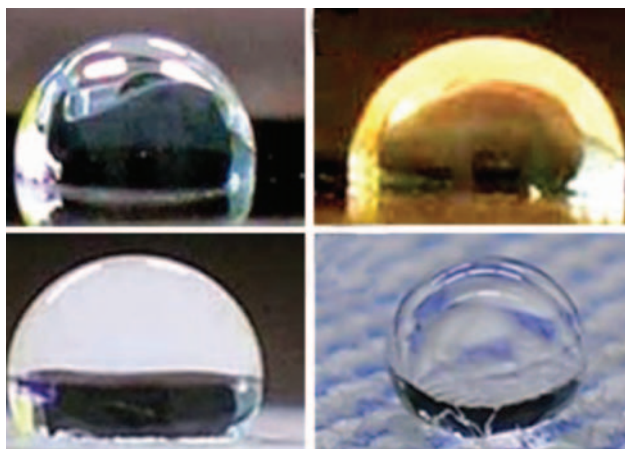
Stable hydrophobic layers can be produced at atmospheric pressure

Waterproof coatings with plasma

Chemical engineers in the US have developed a practical atmospheric plasma treatment process for depositing stable hydrophobic coatings on a range of materials.

The process developed by Seong Kim, assistant professor at Pennsylvania State University and colleagues uses a methane-helium/argon mixture. A smooth hydrocarbon layer can be deposited on a range of substrates, both metallic and insulating, under the same operating conditions. The result is a material with both good and durable hydrophobicity regardless of the substrate.

Materials with hydrophobic coatings are used in the production of waterproof clothing and in corrosion prevention. Plasma-based techniques, which slowly pass a substrate under the ionised gas, are



Many different substrates can be coated with ease

often used to deposit the coatings. This is because they do not produce any chemical waste and it can be fully automated. In the past such techniques were

slow and not suitable for continuous in-line manufacturing because the samples needed to be transferred into and out of a vacuum system. Recently plasma processes at atmospheric pressure have been used to overcome this problem, but plasma stability and low power operation have remained challenging.

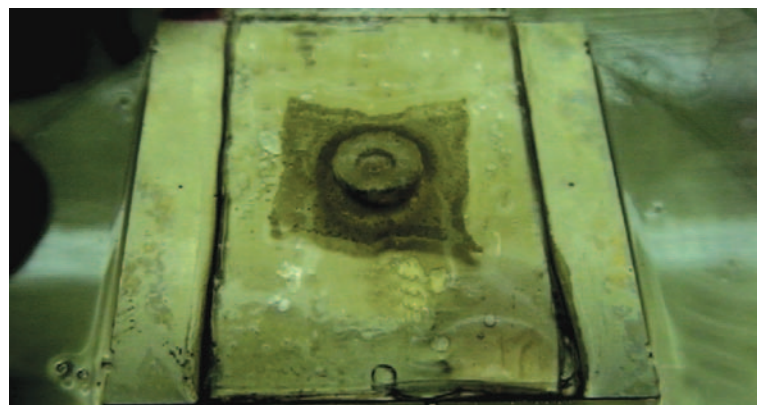
Kim said the system could easily be scaled up for continuous in-line processing. This is because of the stability of the hydrophobic coating and the wide variety of materials that can be coated, together with the fact that the technique operates under atmospheric conditions.
Caroline Moore

Reference

J-H Kim, G Liu and S H Kim, *J. Mater. Chem.*, 2006 (DOI: 10.1039/b516329c)

Cell-powered systems could show potential for drug-delivery

Microfluidic devices with heart



Japanese researchers have harnessed the pumping power of heart cells to make better microfluidic devices.

Researchers from the Core Research for Evolutional Science and Technology project in Japan, led by Takehiko Kitamori of the University of Tokyo, have developed a miniaturized pump powered by heart cells for use on a chip.

The use of cells in microfluidic

devices currently exploits biochemical function, but Kitamori has focused on mechanical properties. Sheets of heart cells (cardiomyocytes), which contract as the heart beats, have been harnessed to form chip-based actuators.

Cellular systems often exhibit complex behaviour that is difficult to replicate, so researchers have long aimed to incorporate cellular

The devices use the mechanical strengths of heart cells

systems into miniaturized total analysis systems. The volume of fluid required by the chips for these systems is roughly proportional to the size and processing capabilities of cardiomyocytes. Unlike conventional micropumps and micromotors, heart cells can be operated automatically using only glucose and oxygen as their power source, readily turning chemical to mechanical energy.

'The cell-based microchip pumping system [will] enhance fundamental concepts and designs of microfluidic devices,' said Kitamori. Cell-actuated microfluidic devices have potential for use in drug delivery systems whose flow rate varies as the device itself responds to local drug concentrations, according to the team. However, the tissue building blocks of the chip have a limited lifespan that will need to be extended before a practical chip can be built.

Suzanne Abbott

Reference

Y Tanaka *et al*, *Lab Chip*, 2006, **6**, 362

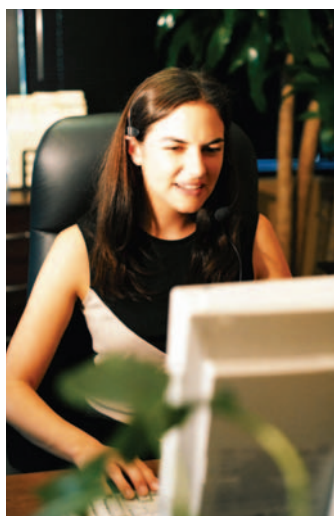
Essential elements

ReSouRce gets even better

A new release of the RSC author and referee portal, ReSouRce, has just been launched complete with a new look and increased functionality.

'User-friendly' and 'intuitive' are just two words that have already been used by authors and referees describing the improved service. Most notable changes to the functionality include the option of saving submissions at key stages during the process (a much-welcomed option for researchers wishing to submit manuscripts, whilst juggling a hectic research schedule!), and online help facilities. Checklists and support notes are now available throughout the submission and refereeing processes, assisting and guiding authors and referees every step of the way.

These new features are complemented by a fresh new look, designed to ease navigation



and orientation within the site. User profiles are more visible, presenting individuals with an improved overview of their account details.

The new developments to ReSouRce were the result of

continued communication between RSC staff and the authors and referees that have used the service since its launch in October 2004 and feedback obtained from authors and referees during a survey in September 2005. 'We were overwhelmed with the response from authors and referees who contributed such constructive feedback as part of our survey last year' comments Sula Armstrong, Electronic Products Manager at the RSC, 'We have taken this on board and are delighted to present this new and improved service to RSC authors and referees. Tens of thousands of papers have been submitted or collected from the portal since its launch, proving how popular the service already is. This improved service will no doubt add to this success.'

To find out more, visit: www.rsc.org/resource

Getting under your skin



Can diet help protect against skin cancer? This topic is among the emotive subjects brought together in a recent issue of *Photochemical & Photobiological Sciences*. Researchers from around the world have published their latest findings on photodamage, in Issue 2 (February), 2006 of the increasingly popular photoscience journal. Other highlights include the role of mtDNA, photoaging, photocarcinogenesis and hair damage.

To find out more, visit: www.rsc.org/pps

Cover competition sparks voting frenzy

Faced with the task of selecting the best cover artwork from the creative designs that appeared on journal covers during 2005, RSC Publishing staff recently decided to put it to the vote. The resulting online competition, in which readers could pick their favourite cover from each of sixteen participating titles, closed with thousands of votes having been cast.



'Following the introduction of the new journal cover designs at the beginning of 2005, the contributing authors and our in-house team of designers have provided some stunning cover artwork' commented David

Riddick, Production Manager. 'Staff had their own personal favourites, but we were keen to find out what our readers thought. Their response has been tremendous.' A number of prizes, awarded to randomly selected voters, were offered as an incentive.

To view the winning covers and details of the prize-winners, visit: www.rsc.org/Publishing/Journals/News/covercompetition.asp

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