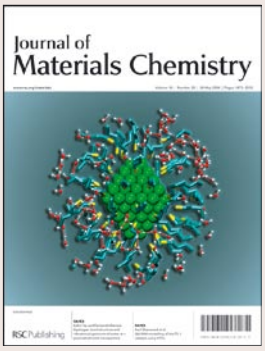
June 2006 / Volume 3 / Issue 6 / ISSN 1744-1560 / CTHEC2 / www.rsc.org/chemicaltechnology

Chemical Technology

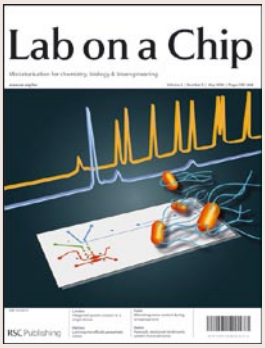
Building sensors block by block



Hybrid polymers with electrical and pH-dependent electrochemical properties could be used as pH sensors. The polymers are functionalised after the polymerisation step.

K Bunga *et al*
J. Mater. Chem., 2006 (DOI 10.1039/b516677m)

Towards programmable devices



The possibility of managing a thousand on-chip valves with only eleven off-chip controls has been demonstrated for lab-on-a-chip devices. They are held open for minutes with brief pressure pulses and reduce power consumption.

W H Grover *et al*
Lab Chip, 2006, **6**, 623

CDs offer promise for virus detection?

Compact discs can be used as molecular screening surfaces for biosensing. Chemists from Spain used them to detect different genetic variations of a plant virus using microarrays of DNA.

S Morais *et al*
Chem. Commun, 2006, 2368

Skill in spider's silk spinning

The way a spider spins its silk is as important to its quality as the proteins used to make it. Manufacturers need to learn from spiders how to make artificial silk with the remarkable qualities of the natural version.

Z Shao, X Chen and F Vollrath, *Soft Matter*, 2006, **2**, 448

See www.rsc.org/chemicaltechnology for full versions of these articles

Contact us: Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF. E-mail chemicaltechnology@rsc.org, Tel +44 (0)1223 420066.

Application highlights

Silicon composite absorbs UV light to prevent decomposition of molecules

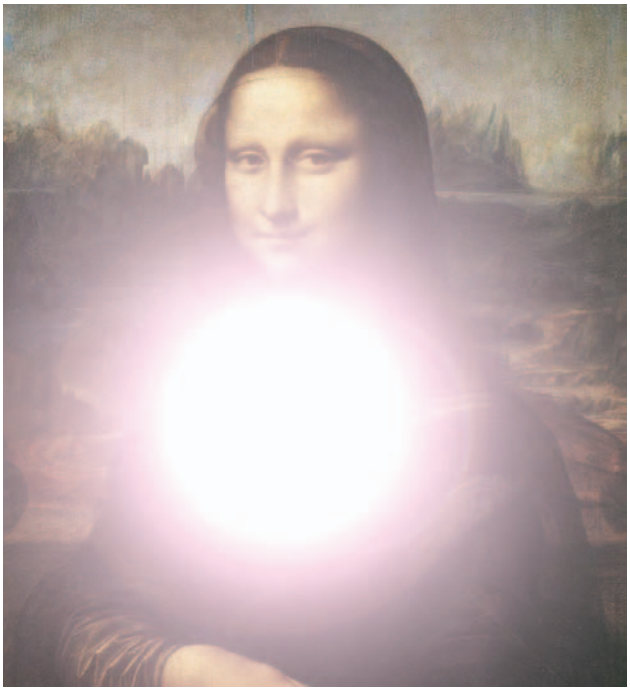
Coating protects organic materials

Materials scientists in Spain have used sol–gel technology to develop a UV protective coating, which they say can protect organic materials from light damage.

David Levy and colleagues at the Materials Science Institute of Madrid inserted a benzophenone into ormosil, an organically modified silica that forms well-defined porous networks. The benzophenone chosen has good photostability and strong UV absorption capability. Ormosil is an ideal substrate because its porosity allows high loading, and it can be modified at room temperature.

The resulting matrix creates a transparent UV protective coating without the often encountered problem of high temperature curing. Levy found that photodegradation rates of a fluorescent dye were 14 times slower after it had been coated with the ormosil–benzophenone composite.

Photodegradation occurs when organic materials susceptible to decomposition are exposed to light. Artificial light, such as flash photography, can be just as damaging as sunlight.



Flash photography can damage valuable paintings

The ormosil–benzophenone coating is effective because it absorbs and dissipates UV radiation before it reaches the organic material, according to Levy. He added: 'it can be applied to almost any material exposed to strong light sources. It could even be used to protect artwork in museums from flash photography.'

Christopher Liauw, from the Division of Chemistry and Materials at Manchester Metropolitan University, welcomed the work. 'This is a novel approach to UV protection that places the UV absorber exactly where it is needed,' Liauw said.

Janet Crombie

Reference
P G Parejo, M Zayat and D Levy, *J. Mater. Chem.*, 2006 (DOI: 10.1039/b601577h)

Studying the trajectory of light particles means shorter distances can be measured

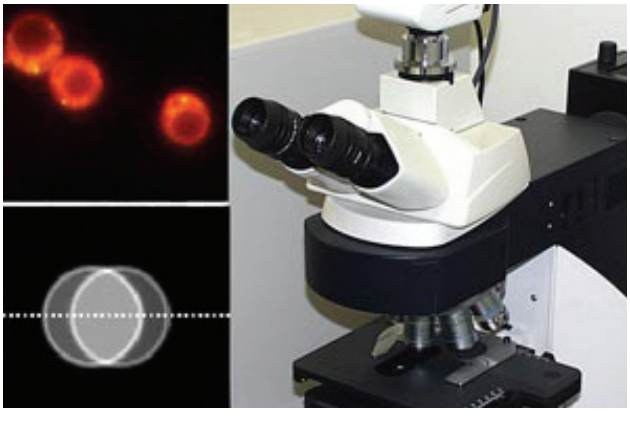
Fluorescent bursts aid nano-imaging

US chemists have measured nanometre distances previously unattainable by conventional microscopy.

Robin Hochstrasser's team from the University of Pennsylvania claim that the technique, which uses a fluorescent probe, can easily be used with existing microscopes and has potential uses in nanotechnology and biological systems.

The probe, known as Nile Red, is non-fluorescent in water but emits light when bound to a hydrophobic particle. By studying the trajectory of fluorescent bursts emitted by Nile Red molecules when they collided with lipid vesicles, Hochstrasser calculated the inter-vesicle distances.

The resolution of the technique, known as trajectory time distribution optical microscopy, is not limited by diffraction in the same way as conventional microscopy, enabling Hochstrasser to measure inter-vesicle distances as small as 160 nm.



The technique could distinguish between objects only 40 nm apart

Aiping Zhu, an expert in fluorescence microscopy from the University of Michigan, US, sees the potential of Hochstrasser's technique. 'This method substantially improves spatial resolution of the microscope and is therefore very significant,' he said.

Hochstrasser's team are now working on creating images in living cells. Point-like objects with a separation as small as 40 nm should be distinguishable, if predictions from simulated results are correct, he said.

'The next step is the construction of a high spatial stability imaging microscope based on the principles of this research,' said Hochstrasser.

Joanne Thomson

Reference
E Mei, F Gao and R M Hochstrasser, *Phys. Chem. Chem. Phys.*, 2006, **8**, 2077

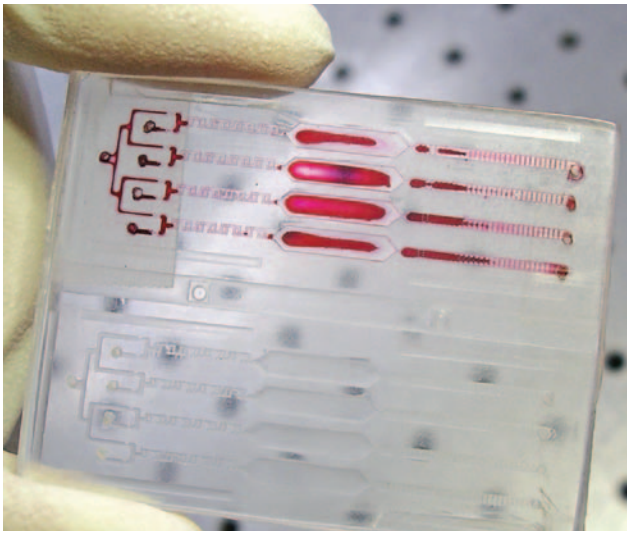
Blood groups can be identified quickly and easily

Blood on a chip

South Korean and American scientists have developed a low-cost biochip that can be used to identify a person's blood group by eye.

Tai Hun Kwon from the Pohang University of Science and Technology led a team of researchers to produce a prototype biochip that they used to determine the blood group of several blood samples.

The blood group of a sample is found by checking which of several known blood cell and serum types the sample reacts with. Red blood cells can contain either or both A or B antigens, and blood will react with cells containing a different type of antigen. For example, type A blood will react to the B antigens in type B or AB cells, but it will not react with type A cells or type O cells (which contain neither of the antigens). The red blood cells in the sample respond by agglutinating, forming clumps that can be seen by the naked eye in Kwon's device.



The prototype uses only three microlitres of blood

At present there are several ways of checking blood groups, but they are all expensive or must be performed manually, said Kwon. The new device is made from injection moulded plastic, which the team hopes will make it suitable for mass production. It only takes three minutes to identify the blood group of a sample, and can work with as little as three microlitres of blood.

Quickly identifying blood groups is important in a wide variety of medical tests, including checking that a blood transfusion or organ donation will not cause a dangerous immune response in the patient.

Kwon said that the biochip could provide a platform for 'developing low-cost disposable plastic labs-on-chips ... for a wide variety of diagnostic examinations.'

Clare Boothby

Reference

D S Kim *et al*, *Lab Chip*, 2006 (DOI: 10.1039/b516495h)

Higher through-put for mass spectrometry promised with solvent spray method

Analysis of complex samples made easier

A direct method for analysing complex samples, such as urine or milk, has been developed by researchers in the US.

Graham Cooks' team at Purdue University conceived a sample introduction method for spectroscopic analysis that would avoid time consuming sample preparation.

Cooks' method collides a spray of sample with a spray of solvent under ambient conditions. The colliding microdroplets react and any compounds of interest can be fed directly into the mass spectrometer for analysis.

This avoids a drawback of conventional mass spectrometry: the pre-analysis steps for samples like urine, milk and polluted water. Usually these mixtures will undergo several 'clean-up' steps, to dilute down and remove excess salts that tend to interfere with the technique.

Cooks hopes that this technology will be used to analyse a variety of problematic samples. 'Screening of urine for metabolic abnormalities, for pharmacokinetics studies, and in drug development research is likely to become much faster as a result of this technology,' said Cooks.

Mixtures normally require several steps before analysis

'Applications to environmental sampling are also facilitated by the lack of sample preparation and the very high sensitivity of the method.'

This would result in shorter times and lower costs, and would also enable a high through-put of samples, Cooks said. In addition, the solvent can be customised to the sample being analysed, making the technique very versatile.

'I have no doubt that this will become a widely used technique for which the community of analytical chemists will be grateful,' said John Fenn, of Virginia Commonwealth University, Richmond, US, who won the Nobel prize for chemistry in 2002 for the development of soft desorption ionisation methods for mass spectrometry.

Michele Zgraggen

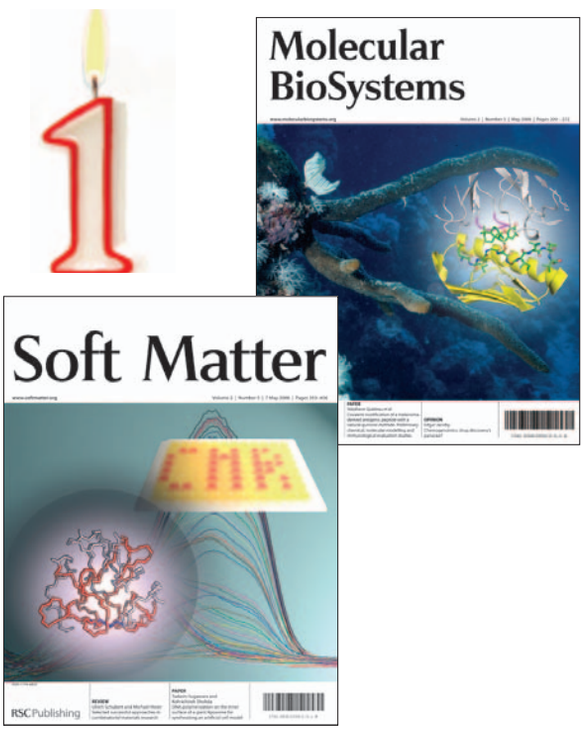
Reference

R G Cooks, H Chen and A Venter, *Chem. Commun.*, 2006, 2042

ISTOCKPHOTOS

Essential elements

Many happy returns!



First birthdays are usually quite a milestone for anyone, with celebrations, gifts and a look back on how the individual has grown. The Royal Society of Chemistry's two new interdisciplinary journals, *Molecular BioSystems* and *Soft Matter*, are no different and having completed their first year of publication, it's time to celebrate and look back on their successes.

Both journals have attracted research from leading scientists from around the world and across the disciplines. In its first year, *Soft Matter* has published papers on topics as diverse as surface science, polymer brushes, biological ion channels, core–shell nanoparticles, flow of complex fluids, and liquid crystals. Meanwhile, *Molecular BioSystems* has covered topics including the control of stem cell development using small molecules, protein clustering, cell isolation and analytical methods for identifying genes.

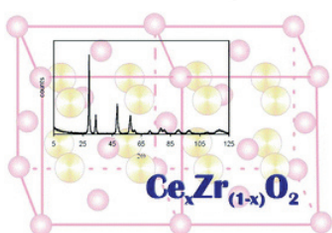
Authors and readers of the journals have benefited from the exceptional publication times for which RSC Publishing is renowned, publishing the latest research faster. Ground-breaking papers and cutting-edge science are highlighted and promoted on our website and via news supplements such as this, and on the attractive journal covers of every issue.

So what's in store for their future? For *Soft Matter*, the editor Carol Stanier is keen to develop the journal in the bio-related sciences arena. New editorial board members, Joachim Spatz from the Max Planck Institute für Metallforschung and University of Heidelberg, Germany and David Bensimon from Ecole Normale Superieure, France, have been appointed to guide the journal as it looks to publish more research on the biological aspects of soft matter. For *Molecular BioSystems*, the introduction of new additional online features will include links to major databases including PubChem, links to freely downloadable ChemDraw figures for significant structures and RSS feeds for journal Advance Articles.

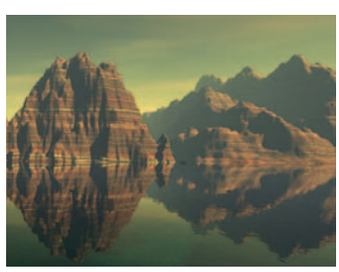
With an outstanding scientific start, strong positive feedback from the community and some exciting new developments in the pipeline, a successful future for *Soft Matter* and *Molecular BioSystems* looks certain.

Find out more, and to read the journals for free, visit: www.molecularbiosystems.org and www.softmatter.org

And finally....



A recent article by Di Monte and Kaspar in *Journal of Materials Chemistry* reviewing the properties of ceria- and zirconia-based mixed oxides has become the second (Essential Science Indicator) Fast Breaking Paper in a row for the Journal. Mixed oxides spark interest because they are used in a wide variety of areas: from catalysts and ceramics to gas sensors and sunscreens.



MURRAY ROBERTSON

This month's issue of *Chem Soc Rev* features six world class reviews on lanthanides in medicine. Applications include iron removal or supplementation; contrast agents in imaging; mobilization of undesirable excess metal ions; and in radiotherapy...proving there's much more to this important series than a footnote to the periodic table.

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