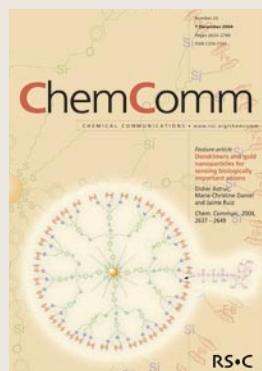


Chemical Technology

One for the road



Japanese researchers from Waseda University in Tokyo and the Tokyo Institute of Technology have prepared hydrogen at room temperature and atmospheric pressure from ethanol and steam by a low-energy pulsed plasma discharge in combination with a carbon-fibre electrode. This method represents a safe way to provide hydrogen for proton-exchange membrane fuel cells, whose efficiency, light weight and lack of waste products except water vapour is attracting interest for transportation applications and small-scale power generation.

Y Sekine *et al*
Chem. Commun., 2005 (DOI: 10.1039/b412552e)

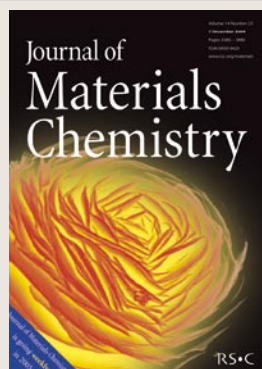
Greening the aldol reaction



The aldol reaction is one of the most useful and best known organic reactions. It has a wide range of applications in bulk production, fine chemical and pharmaceutical industries. Ramon Mestres at the University of Valencia, Spain, presents an examination of the aldol reaction from a green chemistry viewpoint. Many of the environmentally more benign solutions developed for the aldol reaction also have the potential to be introduced more widely to other synthetic procedures.

R Mestres
Green Chem., 2004 (DOI: 10.1039/b409143b)

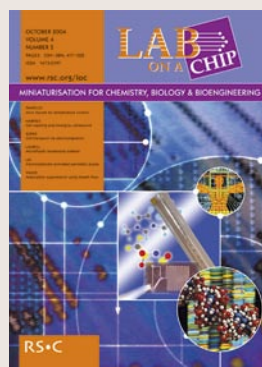
New ceramic fibres



Materials used for military and space applications must withstand very high temperatures. Ceramic matrix composites (CMCs) have been developed to replace metallic materials for these industries, their high thermal and oxidative stabilities making Si-B-C-N ceramics particularly important. French and German researchers, led by Samuel Bernard, have collaborated to produce a precursor which can be spun into polymer fibres before pyrolysis, the resulting amorphous ceramic fibres having controllable microstructures and mechanical properties.

S Bernard *et al*.
J. Mater. Chem., 2005 (DOI: 10.1039/b408295h)

Just like a fish or an insect



Scientists in Madison, US, have successfully designed and built a magnetically-driven biomimetic micropump to achieve efficient energy transfer without requiring on-chip power sources. Inspired by the way fish and flying insects use vortices to propel themselves, Beebe and colleagues have produced a simple and robust micropump consisting of a ferromagnetic bar in which a controllable oscillation is created due to its restricted movement in a small chamber. Vortices generated this way were utilised to create liquid flow inside a chip.

J Atencia and D Beebe
Lab Chip, 2004 (DOI: 10.1039/b407710e)

Application highlights

Cirrus cloud formation may be affected by wet exhaust soot

Aircraft clouding the skies

The ability of soot particles to adsorb water has been examined by Russian scientists in an effort to determine their involvement in cloud formation.

Soot from aircraft exhausts can help ice to form in cirrus clouds

Black carbon, or soot particles from aircraft exhaust are one of the main constituents of background aerosols in the upper atmosphere. Carbonaceous particles can act as ice-nuclei for cirrus cloud formation, but exactly how much ice-nucleating ability soot particles have is uncertain.

To be incorporated into clouds, particles in the atmosphere must be able to adsorb water onto their surfaces, but soot particles have traditionally been found to be hydrophobic in nature. This has led to the widespread assumption that freshly emitted soot particles are poor ice nuclei, and become involved in cloud nucleation only after their surfaces are covered by soluble sulfur-containing compounds such as sulfuric acid.

To throw more light on the processes involved, Olga Popovicheva and colleagues from

Moscow State University examined the wettability of aircraft combustor and kerosene flame soots. They found that soot could be a relatively good water adsorber, even without any soluble sulfur-containing compounds, and they identified a specific mechanism for water adsorption on to active sites on the particle surface. This allows water to condense on the insoluble soot particles even in unsaturated conditions. Aircraft exhaust soot particles may therefore play a bigger role in cirrus cloud formation than was previously thought.

Popovicheva hopes the work will develop in the future to form the basis of a global model to estimate aircraft-induced climate change.
Rowena Milan

Reference

N M Persiantseva, O B Popovicheva and N K Shonija, *J. Environ. Monit.*, 2004 (DOI: 10.1039/b407770a)

New SERS probe for biological samples

Softly, softly approach to analysis

German researchers have developed an improved probe for use in the surface enhanced Raman spectroscopy (SERS) of sensitive biological samples. The probe has been tested in the field to measure traces of pesticides and fungicides on the surfaces of mint, vine leaves and citrus fruits.

Jurgen Popp at the Institut für Physikalische Chemie in Jena, has led the development, which cuts the laser power needed for experiments in half and is far less destructive than conventional techniques.

Traditionally, biological samples are extracted, separated and then analysed by chromatography. Raman spectroscopy has the advantage of being performed directly on the sample and the effects of any water present in the sample are reduced. Analysis can be conducted on limited material and this affects the rapid identification of microorganisms since time

consuming cultivation of microbes is avoided.

SERS uses an electrochemically roughened silver surface as a substrate to enhance the Raman

New glass fibre probes make analysis of delicate biological samples easier

signal. The most commonly used substrate is colloidal silver. Unfortunately silver can modify or destroy the biological samples electrochemically making it desirable to minimise any contact between sample and substrate.

Popp and colleagues have developed a glass fibre probe with a specially treated tip onto which a SERS active layer is applied. The fibre tip's small diameter means that the laser and active silver layer make only minimal interaction with the sample. This reduces the likelihood of sensitive material decomposing.

Field measurements taken with this new system also reduce the possibility of the sample degrading when it is transported from its natural environment to the laboratory. *Suzanne Abbott*

Reference

R Geßner *et al.*, *Analyst*, 2004 (DOI: 10.1039/b411690a)

Microchips killed the radio star

Scientists from the US have adapted standard equipment used for making vinyl records to assemble cell networks and produce microfluidic structures.

The ability to engineer microscale structures with varying heights

Getting into the groove: vinyl record making technology is applied to microfluidics

is very helpful for biomedical research and critical for many miniaturisation fields. Soft lithography, which combines photolithography and polymer moulding, is widely used and simple, but is hampered by the need for toxic photoresist materials and clean rooms.

Emilia Entcheva and Harold Bien at Stony Brook University, New York, have developed what they call 'acoustic micromachining', a non-photolithographic technique which uses equipment normally used to mass produce vinyl records.

The approach employs an audio signal to encode the desired spatial pattern, and allows smooth depth variations in the machined channels, which may prove helpful for biomedical problems and is not possible with photolithography.

Entcheva and Bien have used acoustic micromachining to produce microfluidic structures and wavy polymer fibres, and to assemble networks of cells on 3D scaffolds. They propose that the method will be widely applicable in biomedical research. *Rowena Milan*

Reference

E Entcheva and H Bien, *Lab Chip*, 2004 (DOI: 10.1039/b409478f)

Careful chlorine measurements

Researchers in the US have reported a new robust system to measure accurately very low concentrations of chlorine in fossil fuels.

Chlorine is a significant pollution by-product of fossil fuel combustion, and it needs to be monitored carefully. As the environmental implications of chlorine bring tighter regulations into effect, many industries will be concerned with determining its content in fossil fuels, because the bulk of the chlorine present is emitted during combustion. Chlorine also affects mercury emission as it oxidises elemental mercury in fossil fuels to form mercury oxide.

By combining modified Carius combustion tubes – a simple technique in use since the 1940s to quantify combustion products

Accurate measurements of fossil fuel's chlorine content can now be made

– with negative ion thermal ionisation mass spectrometry, Maury Howard and the group at Southeastern Louisiana University have obtained accurate chlorine content measurements.

The researchers used Carius tubes to create a high-pressure, high-temperature closed system that overcomes difficulties previously associated with chlorine extraction, such as loss of sample. Evolved chlorine is trapped as silver chloride and is analysed by mass spectrometry after purification.

Howard expects the method will also be suitable for measuring chlorine isotope ratios in fossil fuels and chlorinated hydrocarbons.

Carolyn Ackers

Reference

M E Howard and R D Vocke Jr, *J. Anal. At. Spectrom.*, 2004, **19**, 1423

Perfect peak separation

A new technique looks set to surprise analytical chemists and revolutionise ion chromatography.

Brett Paull and colleagues in Dublin, Ireland, and Moscow, Russia, coated a chromatography column with a zwitterionic surfactant in order to employ their new technique dubbed 'double gradient' ion chromatography. In doing so they changed its capacity, and its selectivity with varying pH. Operating simultaneous eluent flow and eluent pH gradients speeds up complex anion separation with remarkable efficiency.

Chromatographers are always looking to improve the resolution of their separations while reducing overall run times. The use of gradient flow rates with highly permeable monolithic stationary phases leads to fast separation, but without improving the overall selectivity. This limits the application of these columns to separations with big differences in retention volume.

The authors are excited by the potential their new technique has to change the way that liquid chromatography is performed. Their hope is to challenge conventional thinking about the scope of short monolithic columns.

Sula Armstrong

Reference

B Paull, C Ó Riordáin and P N Nesterenko *Chem. Commun.*, 2005 (DOI: 10.1039/b414323j)

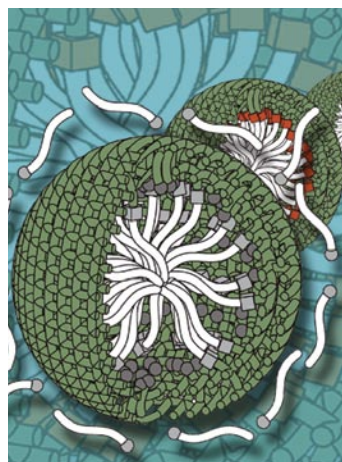
RSC breaks boundaries with new journals

The Royal Society of Chemistry has unveiled plans to launch two new interdisciplinary journals, in summer 2005. The new monthly journals will reflect the emergence of new and exciting fields which lie beyond the traditional boundaries of the chemical sciences.

Soft Matter

Soft materials and complex fluids are amongst the topics to be covered in *Soft Matter*, a new journal focussing on the interface between chemistry and physics. The announcement was made at the Jülich Soft Matter Days 2004 conference.

Soft matter is a rapidly growing research field uniting scientists from a wide range of



scientific disciplines including chemistry, physics, materials science, and biology. This new journal will provide them with a forum for the communication of the generic science underpinning the properties and applications of soft matter.

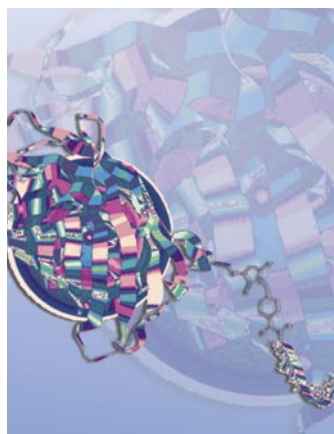
Hosted in the prestigious *Journal of Materials Chemistry*, in print and online, *Soft Matter*, it will make an immediate impact in the community.

'Soft matter pervades our world' says Peter Gregory, managing director of RSC Publishing, 'from biological systems, through washing powders, medical formulations, plastics, and paints to modern TV and computer screens. Methods of designing, producing and controlling these materials will underpin the technological developments of the future. The RSC recognises the importance of this area by launching *Soft Matter*.'

Molecular BioSystems

The interface between chemistry and the -omic sciences, and systems biology is to be the focus of a new journal, *Molecular BioSystems*. The announcement was made at the recent 5th International Conference on Systems Biology (Heidelberg).

'The power of the chemical approach to biology, when combined with the amazing technologies being developed in genomics and proteomics, promises to have a transforming



effect on biological research and clinical medicine' comments Thomas Kodadek, chair of the editorial board and professor at the University of Texas Southwestern Medical Center. 'This journal will strive to be a thought leader in the field'

In addition to Reviews, Communications and Full Papers, the journal will contain Highlights and Opinions. A key feature will be Methods - short primary research articles reporting useful new methodology. Hosted in the RSC's flagship journal, *Chemical Communications*, the new journal will have an instant wide readership at launch.

'A molecular understanding of biological systems, and systems biology, is likely to become one of the most important areas of

scientific endeavour' confirmed Peter Gregory, managing director of publishing at the RSC. '*Molecular BioSystems* represents a clear commitment from the RSC to support scientists working on the development of the chemistry-biology interface.'

● For further information, visit: www.softmatter.org and www.molecularbiosystems.org

And finally.....

● Congratulations to Ben Feringa, chair of the editorial board for *Organic & Biomolecular Chemistry* for his induction to the American Academy of Arts & Sciences! The professor from the University of Groningen, in the Netherlands, was awarded the prestigious title of foreign honorary member at an induction ceremony in Cambridge, Massachusetts.

● *Crime Scene to Court*, 2nd edition was recorded as the 4th bestselling science book in a recent sales list published in the national newspaper, *The Independent*.

To find out more about this textbook, visit: www.rsc.org/books/crime

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