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Chemical Technology

Catching the DRIFT of wood dust

Roy Rando and his team from Tulane University, New Orleans, US, have developed a new selective and specific method for the occupational exposure assessment of industrial wood dust, which can contain potentially carcinogenic compounds. The researchers employ diffuse reflective infrared Fourier-transform spectroscopy (DRIFTS) to determine the contents of wood dust collected from commercially available exposure filters.

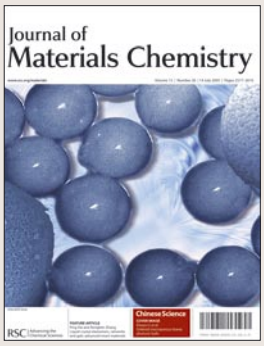
R J Rando *et al*
J. Environ. Monit., 2005, **7**, 675

Better mercury analysis

Measuring mercury might be easier, less costly and portable in the future. US researchers, led by Chuji Wang from Mississippi State University, have developed a laser-based technique which marries the advanced cavity ringdown spectral technique (based on the rate of light absorption confined in an optical cavity) with a novel compact plasma source. Advances in laser and optical coating technologies will make the method even cheaper.

C Wang *et al*
J. Anal. At. Spectrom., 2005, **20**, 638

Precise electrochemical polymerisation



Bruno Fabre and colleagues at the University of Rennes, France, have found a better way of fabricating junctions for miniaturised electronic devices. These can be made to very high precision by electrochemically polymerising pyrrole deposited onto a silicon surface. The most accurate method was found to be using a conducting microscope tip covered in an ink. Future work to optimise the composition of this ink is needed, according to Fabre, to ensure the best conductivity and performance of devices.

B Fabre, S Ababou-Girard and F Solal
J. Mater. Chem., 2005, **15**, 2575

A food solution

Israeli scientists have developed microemulsions capable of solubilising guest molecules normally poorly soluble in the aqueous or oil phase, such as nutraceuticals. By blending hydrophilic surfactants with cosolvents that self-assemble into reverse micelles, Nissim Garti's team at the Hebrew University of Jerusalem obtain structures that can be diluted with an aqueous phase without phase separation.
The micelles invert into oil-in-water nanodroplets with 10–20 times more solubility capacity than current food-grade oils or aqueous phases meaning microemulsions are increasingly promising for incorporating nutraceuticals into food products.

N Garti *et al*
Soft Matter, 2005 (DOI: 10.1039/b506233k)

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Application highlights

Thio arsenosugars detected for the first time in freshwater mussels

Arsenic levels in fish need re-evaluating

Freshwater mussels from the Hungarian Danube river have provided clues that arsenic pollution is more widespread than previously thought.

Csilla Soeroes from Corvinus University, Budapest, and colleagues in Austria, have investigated arsenic compounds in mussels from the Danube. Soeroes' group measured arsenic levels using chromatography and mass spectrometry. The main arsenic-containing compounds extracted were two oxo sugars and their sulfur analogues. This is the first time that thio arsenosugars – sugars containing both sulfur and arsenic – have been detected in freshwater mussels.

Mussels get their food by filter feeding, a process where food particles and small organisms are randomly strained from water.

Toxic heavy metals accumulate in molluscs and transfer to humans through the food chain

This leads to the accumulation of metals in the mussels' soft body parts. Consequently, the amount of arsenic in these animals reflects the degree of metal pollution in the aquatic environment. Heavy metals can also be transferred from molluscs to humans though the food chain.

Soeroes' work suggests that the arsenic cycle in the freshwater food web is very different from that in marine systems. 'Based on the results the maximal permissible arsenic concentration in fish products will probably be re-evaluated,' said Soeroes.

Remaining challenges include improving extraction efficiency and understanding how thio arsenosugars form. Soeroes plans to extend this research by investigating arsenic compounds in other freshwater species. *Niamh O'Connor*

Reference
C Soeroes *et al*, *J. Environ. Monit.*, 2005, **7**, 688

Microreactor could open door to improved amino acid polymer production

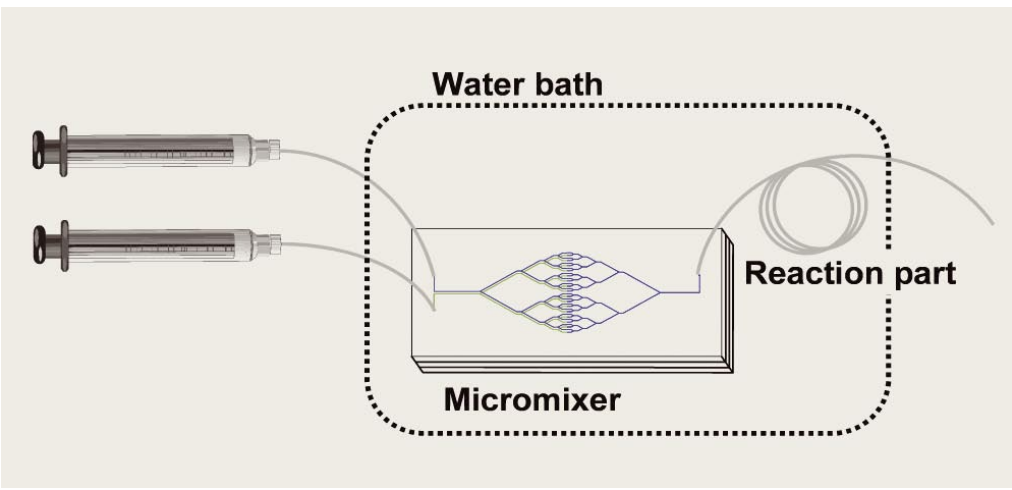
Controllable amino acid polymerisation

A microfluidic system for polymerising amino acids, which could prompt a big step forward in biopolymer synthesis, has been developed by scientists in Japan.

Polymer properties, such as average molecular weight, are hard to control during polymerisations, and cause time-consuming problems for commercialising useful polymers.

Now, Masaya Miyazaki and colleagues at the Nanotechnology Research Institute, Saga, have developed a microreactor that allows amino acid polymerisation to be easily controlled.

In Miyazaki's microreactor, the reagents for the polymerisation are fed into a micromixer by two syringes operated by a syringe pump. This allows the reagents to flow into the micromixer at closely controlled rates, which in turn controls the molecular mass of the polymer produced. Another benefit of the system is that it is cheap to produce, raising the possibility of disposable devices in the future.



Microprocessors have a micromixer to allow control over reagent flow

The most well-known amino acid polymers are naturally occurring proteins, but artificial poly-amino acids with specific properties have also been intensively researched and developed. Lysine-based polymers can stick to cells and have potential for drug delivery to specific places in the body. Properties like these have made poly-amino acids very important in biomedical research and tissue engineering.

Although further improvements to the new system are needed, Miyazaki expects the technique will eventually be useful for making other biomaterials. *Rowena Milan*

Reference
T Honda *et al*, *Lab Chip*, 2005, **5**, 812

Removing heavy metals from water

UK scientists have discovered a new and simple way to remove toxic heavy metals from water.

Prompted by recent publicity surrounding arsenic pollution in the third world, Richard Compton and colleagues from the University of Oxford have come up with a way to eliminate these metals from water.

New materials might help clean up polluted water courses

The group attached L-cysteine methyl ester – which has a similar structure to the naturally occurring amino acid cysteine – to the surfaces of minute glassy carbon spheres. They then added the compound to water samples containing varying amounts of heavy metals, and stirred the mixtures.

When the glassy carbon spheres were removed the amount of toxic metal in the water was reduced significantly. Carbon spheres without the L-cysteine methyl ester did not remove any metal ions from the water.

The material worked equally well in samples of polluted river water and in contaminated drinking water, indicating its potential for both removing heavy metals from drinking water and cleaning polluted water courses.

The group hopes to put its material into commercial development soon. 'This material has the potential to prevent thousands of needless deaths each year,' said Compton. *Lorna Jack*

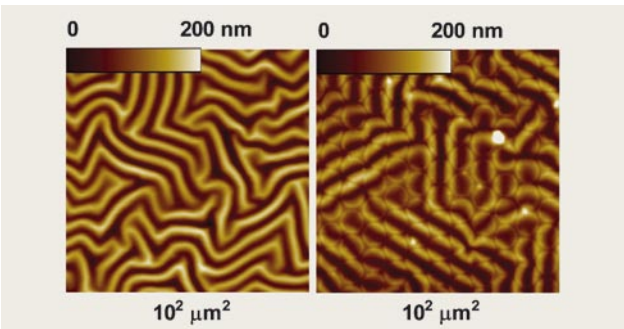
Reference
G G Wildgoose *et al*, *Chem. Commun.*, 2005, 3694

Keeping wrinkles under control

Wrinkles in platinum layers are affected by changes to the polymer substrate before deposition, according to researchers in Japan.

When a layer of platinum is deposited on polydimethylsiloxane (PDMS), wrinkles form spontaneously. Takuya Ohzono and colleagues from RIKEN and Hokkaido University patterned a PDMS surface, before the platinum was deposited, using adhered polystyrene microspheres, and showed how wrinkles are influenced by those patterns.

The microspheres act as a mask when the exposed surface is treated with oxygen plasma. When they are removed, by rinsing in benzene, ring-like ridges are seen. When platinum is then deposited onto this pre-treated PDMS, different wrinkle patterns form. These wrinkles depend on the size of the microspheres.

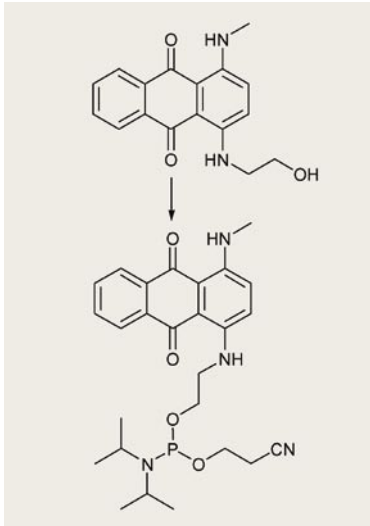


Wrinkles in metal layers can be controlled by their polymer substrate

Ohzono hopes this method of making polymer patterns on a substrate at the sub-micrometre scale will prove useful for technological applications that require precision, such as substrates for tissue growth or microfluidic channels.
Caroline Moore

Reference
T Ohzono, S I Matsushita and M Shimomura, *Soft Matter*, 2005 (DOI:10.1039/b503127c)

Dye lights up chain reaction



An improved fluorescence quencher that can analyse the products of polymerase chain reactions (PCR) has been developed by researchers in the UK.

Tom Brown and co-workers at the University of Southampton have developed their new quencher based on the dye Disperse Blue. The new quencher is more effective than others made to date, because it can absorb a broad range of wavelengths (and hence works with a range of fluorophores). It is also non-fluorescent, so problems with background fluorescence are eliminated.

PCR involves copying a DNA sequence enough times to be able to characterise it. Fluorescent compounds (fluorophores) are used to follow the progress of the reaction. These fluorophores emit light when the product is formed. The fluorophore starts out close to a quencher, keeping the fluorophore turned off. As the reaction progresses, the fluorophore and quencher become separated, and the fluorophore lights up.

The new quencher will allow shorter probes for PCR to be developed, and add to the progress of real-time PCR analysis.
David Barden

Reference
J P May *et al*., *Org. Biomol. Chem*., 2005, **3**, 2534

Essential elements

First sitting PM at RSC event

The Prime Minister, Rt Hon Tony Blair MP, highlighted the role of science in tackling the challenges of tomorrow, when he addressed scientists and politicians, at the RSC's annual Parliamentary Links Day in the House of Commons.

The theme, 'The science behind the G8 summit', focussed on the issues of climate change and Africa and was also addressed by the Secretary of State for International Development, the Government's Chief Scientific Adviser and the Minister for Science and Innovation. Other speakers at the event included representatives from all the UK's major scientific societies such as the Institute of Physics, the Institute of Biology, the Royal Society, Royal Academy of Engineering and the Campaign for Science and Engineering.

In a Special Message the Prime Minister praised Links Day, calling it 'the foremost scientific gathering in the Parliamentary calendar' and the following day told a packed House of Commons that he had been very pleased to attend such a 'thriving' occasion. It was the first time in history that any sitting Prime Minister had ever attended a Society event.

Journals launched at Utrecht and Budapest

RSC Publishing formally marked the launch of two of its new journals at international conferences held last month. *Soft Matter* was officially launched at 6th Liquid Matter conference held in Utrecht, The Netherlands.

The meeting, like the journal, attracted much interest from specialists from a wide range of scientific backgrounds. 900 delegates at the conference marked the launch by joining the journals' editor, Carol Stanier, for a slice of celebratory cake.

Meanwhile, the 30th FEBS Congress was the venue for the launch celebrations of *Molecular BioSystems*.

The conference held in Budapest, Hungary, attracted more than 2500 delegates and featured an extensive programme of lectures and symposia on protein and peptide science. *Molecular BioSystems* sponsored the Theodor Bücher Lecture and Medal given by Douglas Kell, professor at University of Manchester, UK.

● To find out more about these new journals, visit www.rsc.org/publishing

Making an impact

The latest impact factors, released by ISI®, show an impressive average increase of over 10% for RSC Journals. Calculated annually, ISI® impact factors provide an indication of the quality of a journal - they take into account the number of citations in a given year for all the citeable documents published within a journal in the preceding two years.

Impact factors for *The Analyst*, *Green Chemistry*, *Journal of Analytical Atomic Spectrometry* (JAAS), and *New Journal of Chemistry* all rose by more than 20% whilst the nanotechnology journal, *Lab on a Chip*, bolstered its position as the leading publication in the field with a figure of 5.05. Building on its first impact factor, *Photochemical & Photobiological Sciences* leapt to 1.80 while *Organic & Biomolecular Chemistry* (OBC) received its first impact factor of 2.19, recognising the high-quality science published in the journal during its formative years. Meanwhile, *Chemical Society Reviews* furthered its position as the journal for high quality review material with a figure of 10.84.

These encouraging impact factors are proof that year on year, RSC Journals make an impact.

Data based on 2004 Impact Factors, calculated by ISI®, released on 20th June 2005.

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