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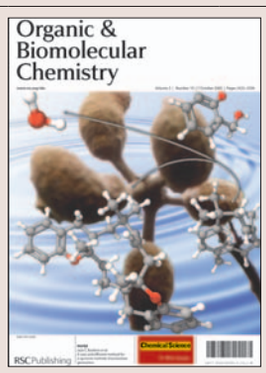
# Chemical Technology

## Bigger ions for better SIMS


Static secondary ion mass spectrometry (S-SIMS) allows direct determination of the molecular composition of intact solid samples, but its usefulness is limited by the number of secondary ions produced when a sample is bombarded by a primary ion beam. Annemie Adriaens from Ghent University, Belgium, and coworkers from the University of Antwerp compared $SF_5^+$ and $Ga^+$ primary ions for molecular speciation of various inorganic solids and found that the polyatomic ions gave significantly improved sensitivity and molecular specificity.

R Van Ham *et al*
*J. Anal. At. Spectrom.*, 2005, **20**, 1111

## Disaccharide synthesis on a TLC plate




The development of 'carbohydrate libraries' to aid the investigation of the function of biomolecules is much sought after. Robert Field and co-workers at the University of East Anglia, UK, have now developed a system for synthesising and separating a range of disaccharides (a type of carbohydrate) in situ on a small scale. Professor Field hopes that in the future the work will lead to the multiple synthesis of these libraries.

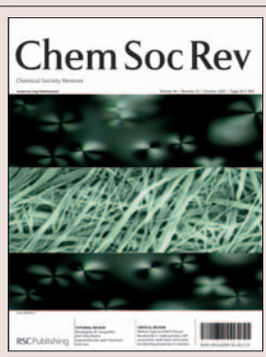
B Mukhopadhyay *et al*
*Org. Biomol. Chem.*, 2005, **3**, 3468

## Better microchips


Chinese researchers led by Guoan Luo of Tsinghua University, Beijing, have helped to overcome some of the unresolved problems in microchip devices for laser-induced fluorescence detection by developing a novel system that uses an organic light emitting diode as the light source, rather than a conventional laser. They improve sensitivity with a thin film filter to remove background interference, and have successfully applied the device to the detection of proteins.

B Yao *et al*
*Lab Chip*, 2005, **5**, 1041

## Gene therapy goes nano




Synthetic self-assembled nanoparticles may hold the key to gene therapy, according to Andrew Miller and Kostas Kostarelos at University College London, UK. The lack of safe, acceptable vectors available to deliver the new genes to patients is a big problem in gene therapy. Miller and Kostarelos argue that synthetic, non-viral systems offer the most realistic choice for the future of the field and introduce a new self-assembled nanoparticle concept with great potential for synthesizing gene therapy vectors.

K Kostarelos and A D Miller
*Chem. Soc. Rev.*, 2005 (DOI: 10.1039/b307062j)

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# Application highlights

## New device detects common additive of plastic explosives

# Sniffer polymers hunt out explosives

A team of US researchers has found a way to sniff out plastic explosives using polymer-based devices.

Current security methods to detect explosive materials rely on the acute senses of trained dogs. Now Timothy Swager and colleagues at the Massachusetts Institute of Technology have developed the devices using amplifying fluorescent polymers that are known to detect the vapours of some high explosives such as 2,4,6-trinitrotoluene (TNT).

To compete with the standards attained by sniffer dogs, these polymer-based devices must be able to sense all types of explosives. Plastic explosives are particularly hard to detect because they have very low vapour pressures.

AP PHOTOS

**New explosive detectors compete with dogs**

**Reference**
S W Thomas *et al*, *Chem. Commun.*, 2005, 4572

However, Swager found that the taggant molecule, 2,3-dimethyl-2,3-dinitrobutane (DMNB), which must legally be added to manufactured plastic explosives, can be detected using the devices.

The additive DMNB proved a difficult molecule for the researchers to detect because the structure is highly three-dimensional and intermolecular binding between the analyte and the film is weak.

Swager and his team took into account the factors that are crucial to detecting vapour phase analytes before testing a range of conjugated polymers.

'The highly sensitive detection which this technology offers of a higher vapour pressure taggant already present in legally manufactured explosives could potentially lead to a screening platform for stolen plastic explosives,' said Swager.

*Alison Stoddart*

## Gold nanoparticles used in protein–protein interactions

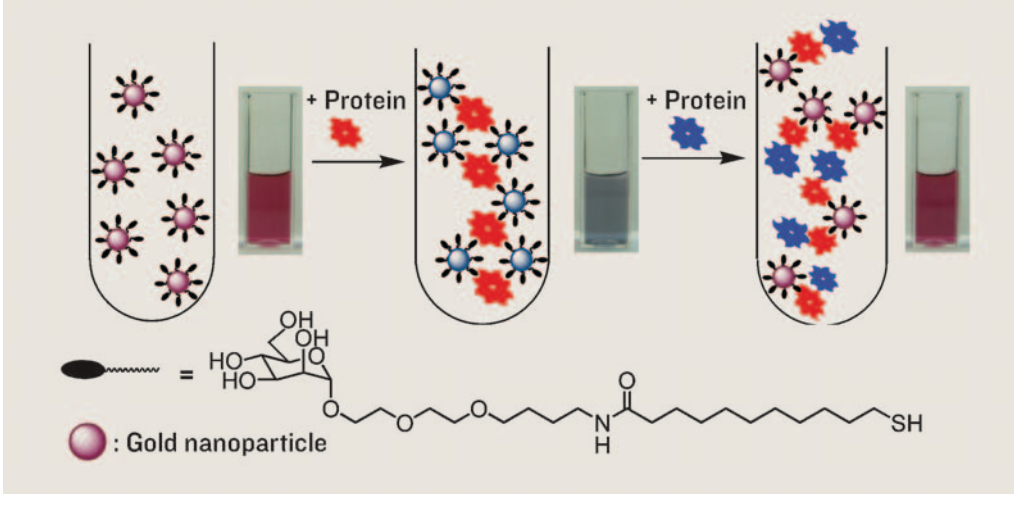
# Golden protein detectors developed

Taiwanese researchers have developed a new sensor for protein–protein interactions based on gold nanoparticles.

Protein–protein interactions are vitally important in living organisms, playing a key role in the organisation of cells. Chao-Tsen Chen and colleagues from the National University of Taiwan have used a reversible colour change technique to evaluate these interactions.

Chen incorporated sugar-capped gold nanoparticles with proteins; the nanoparticles mimic cells or glycoproteins in living organisms. Sugars protruding from the nanoparticles bind to a protein, causing them to agglomerate and change the colour of the solution from burgundy to blue.

Adding another protein, thought to be able to bind to the agglomerated protein, causes a competitive reaction. The original protein–nanoparticle interactions break up giving rise to binding between the two proteins. Releasing the gold nanoparticles results in a colour change back to the original burgundy.




**Simple colour changes denote protein–protein interactions**

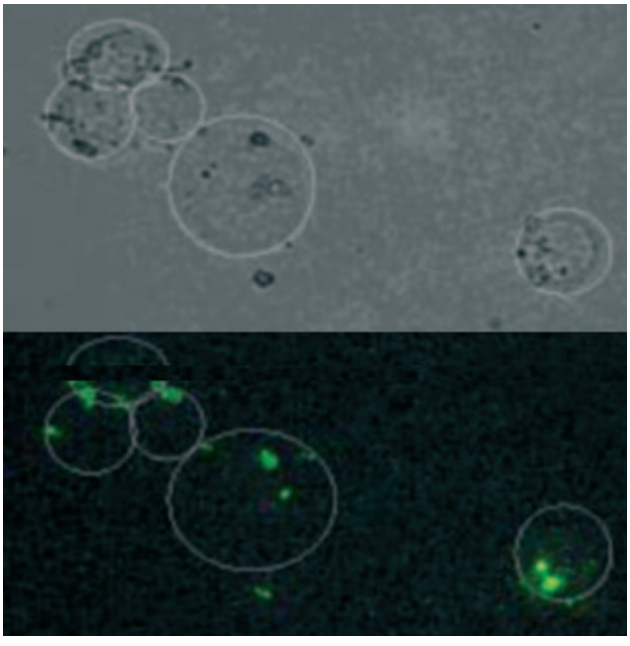
**Reference**
C-S Tsai *et al*, *Chem. Commun.*, 2005, 4273

The process can be monitored by the naked eye, so expensive instrumentation is not needed. This cheap, quick and sensitive method, requiring only nanomolar concentrations of proteins, can be used to analyse thousands of samples simultaneously. A broad range of proteins can be applied to the system, allowing many combinations to be investigated.

Chen says, 'Identifying factors influencing biochemical properties, especially those that are essential to survival, would further help to understand the malfunctions of networks and find the remedy'.

*Sophia Anderton*

# Smart nanospheres recognise dying cells



**Nanospheres with protein attachments highlight apoptotic cells**

A team of Chinese and US chemists has developed a set of tri-functional nanospheres that can monitor cell death. The development could pave the way to new biofunctionalised smart nanospheres with biomedical applications.

Fluorescent and magnetic properties are often combined on single nanospheres for use in biomedical fields. Now a team of researchers, led by Dai-Weng Pang from Wuhan University in China, has functionalised such nanospheres to make them capable of isolating cells showing markers of programmed cell death (apoptosis). This can be a useful indicator of several diseases such as AIDS and chronic hepatitis, when excessive apoptosis occurs.

The chemists attached the covalent protein complex annexin V-biotin to the nanospheres via the biotin unit. The annexin V unit was able to recognise the marker phosphatidylserine present on apoptotic cells. The researchers could then isolate the cells using a magnet and monitor them under fluorescent light.

*Katherine Vickers*

**Reference**
G.P. Wang *et al*, *Chem. Commun.*, 2005, 4276

# Fluorescence picks up bioaerosols

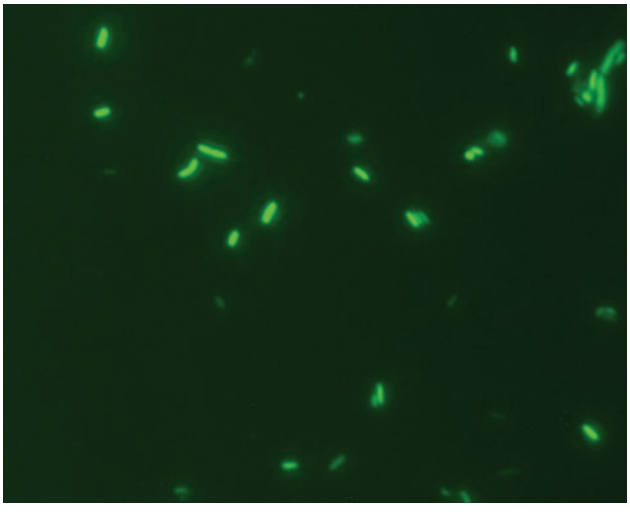
Recent bioterrorism threats have renewed interest in developing effective ways of monitoring bioaerosols. Taiwanese researchers have combined flow cytometry with a fluorescent technique to determine the concentration and viability of bacterial and fungal bioaerosols in environmental air and water samples.

They discovered that two dyes (SYTO-13 and YOPRO-1) were particularly effective at monitoring bioaerosols including *Escherichia coli*. The researchers validated the method using air and water samples from the aeration tank of a hospital wastewater treatment plant.

The technique has the advantages of improved accuracy and speed over traditional culture and microscopic methods that have limited use in routine monitoring because of their time consuming and operator-dependent nature.

Future work will focus on extending the optimised technique for microorganism and bioaerosol monitoring in different environments.

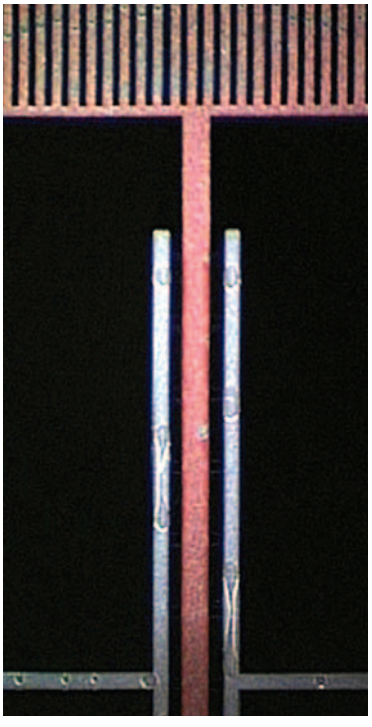
*Helen Lunn*



**YOPRO-1 stained *E. coli* visualised using epifluorescence microscopy**

**Reference**
P S Chen and C S Li, *J. Environ. Monit.*, 2005 (DOI:10.1039/b505224f)

# A drop of blood



US researchers have developed a microfluidic device that can isolate plasma from whole blood, bringing the notion of point-of-care blood analysis a step closer.

Developing miniaturised portable devices to analyse biological fluids is an important move towards enabling rapid, low-cost clinical diagnosis. Currently such devices require filtration technologies, such as filter paper or microporous membranes, which are not easy to integrate with microfabrication techniques.

Timothy Crowley and Vincent Pizziconi from Arizona State University, US, have come up with an original approach to overcome this. By precisely machining microfilters that work via capillary action, the researchers have been able to control the geometries of the pores and channels within their microfilters. This has allowed them to optimise the design of the filters so that they can effectively isolate nanolitre volumes of plasma from a single drop of blood.

*Caroline Moore*

**Reference**
T A Crowley and V Pizziconi, *Lab Chip*, 2005, **5**, 922

# Essential elements

## News from across the globe

Over 200 people gathered at a reception in the JW Marriot hotel, Washington, on 29th August to celebrate the launch of the two new RSC journals, *Molecular BioSystems* and *Soft Matter*. Coinciding with the 230th ACS National Meeting, the reception was hosted by Dr Neville Reed, RSC Director of Communication and Membership. Among the guests were representatives from the ACS and international figures from the world of chemical sciences.

On the other side of the world, RSC Publishing staff were at the 11th Asian Chemical Congress in Seoul, where the RSC co-hosted a one-day symposium on 'Chemistry in Electronics' with the Korean Chemical Society. The conference was preceded by visits to four universities in the country, including Korea Advanced Institute of Science and Technology (KAIST).


**Peter Atkins (centre) and ACS President William Carroll (right) with the RSC's Stanley Langer**

## Calling all chemical biologists!


*Chemical Biology*, a sister-title to *Chemical Science* and *Chemical Technology* is being launched soon. Complementing the news service offered by the first two news supplements, it will focus on the more biological aspects of research published in RSC journals.

Chemical biology is a rapidly expanding area of chemistry as supplement editor, Kate Sear, comments 'chemistry or chemical techniques are now integral to the understanding of biological processes at the atomic and molecular level. The RSC has recognised the significance and value of the exciting research in this area, and is building upon the success of its existing chemical biology portfolio, by launching this new supplement.'

Latest news will be added to the online version of the supplement 'as it happens', ensuring that academics interested in the field will have access to the most up-to-date information.

The news article will directly link to the original research article, providing interested readers with free access to the original research.

Monthly print issues will be also included in *ChemComm*, *Organic & Biomolecular Chemistry*, *Molecular BioSystems* and *Natural Product Reports*.

## What happened next?

Ever read an interesting piece of research published in a RSC journal and wondered just what happened next?

Now you can find out, thanks to a new technology introduced by RSC Publishing.

'Forward linking', the opposite of reference linking, enables readers to link from any RSC published paper to the articles in which it is cited. In essence, it allows researchers to easily track the progression of a concept or discovery, since its original publication. With one click of a button (on the 'search for citing articles' link) a list of citing articles is presented, complete with DOI links.

At a time when research is becoming increasingly interdisciplinary in nature and the amount of published works continues to grow, it is hoped that the new technology, developed in conjunction with CrossRef, will significantly reduce the time spent by researchers searching for information.

RSC Publishing is committed to continued investment in publishing products and services, and this latest facility is set to transform the way in which researchers use its publications.

*Look out for news of other developments in next month's issue: RSS feeds.*

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