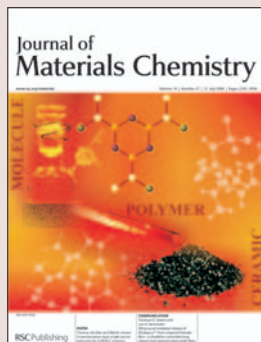


# Chemical Technology

## Durable materials for aircraft engines



Researchers in Germany have made a material that can withstand extremely high temperature – up to 2000°C. The Si/B/N/C ceramic is made using a borazine precursor and has potential applications in engines for aeroplanes.

T Jäschke and M Jansen  
*J. Mater. Chem.*, 2006, **16**, 2792

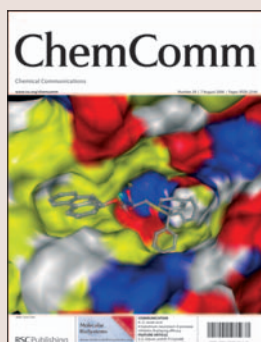
## Raman the solution to a micro problem



French researchers have shown that Raman spectroscopy is ideal for studying reactions in the microdroplets used in lab-on-a-chip devices. The technique is better at distinguishing between different molecules than the fluorescence techniques normally used.

G Cristobal *et al*  
*Lab Chip*, 2006 (DOI: 10.1039/b602702d)

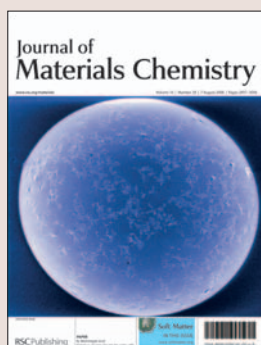
## Polymer nanowires for biosensors



Scientists in the US have discovered a way of making nanowire-based electronic biosensors in one short step. Conducting polymer nanowires are grown directly into microfluidic channels and the device can be used as a sensor straight away.


J Wang *et al*  
*Chem. Commun.*, 2006, 3075

## Flexible nanonetworks



In the future, you might be reading this on a device made from foldable electronic paper, according to an American scientist. Networks of randomly aligned carbon nanotubes produce fully flexible and transparent films that can conduct current.

G Gruner  
*J. Mater. Chem.*, 2006 (DOI: 10.1039/b603821m)

 See [www.rsc.org/chemicaltechnology](http://www.rsc.org/chemicaltechnology) for full versions of these articles

# Application highlights

The selectivity and sensitivity of a natural nose is retained

## Bioelectronic nose sniffs out odours

Researchers in France have developed a bioelectronic nose that they hope will find applications in cancer diagnosis.

Jasmina Vidic and colleagues at the National Institute for Agronomic Research at Jouy-en-Josas are aiming to develop highly sensitive bioelectronic noses based on natural olfactory receptors (the cells in the nose that allow us to detect smells). To do this they needed to show that the receptors could function outside a living organism. Therefore, to keep the receptors in their natural lipid environment, Vidic and co-workers expressed them in yeast cells from which microspheres containing the olfactory receptors were created. The team attached the microspheres, also called nanosomes, to a chip to create the sensor.

Vidic assessed the sensitivity



of the immobilised nanosomes by testing their response to different concentrations of various volatile chemicals. The results show that the selectivity and sensitivity of the natural cells are retained in the device.

Vidic hopes to create a 'new

**Nasal cells are used in an electronic device**

### Reference

J M Vidic et al, *Lab Chip*, 2006, **6**, 1026

nano-bioelectronic sensor based on olfactory receptors able to detect odorants in the urine of patients with prostate or bladder cancer'. Other possible applications include sensors for trace explosives or illegal drugs.

Current electronic nose devices find applications for quality control in the food, beverage and cosmetics industries and for detecting pollutants and gas leaks. They are based on metal oxide semiconductors or conducting polymers, and are usually expensive and require a large sample size.

Boris Lakard from the University of France-Comté said that Vidic's biosensor could provide an alternative to these devices and 'be used to identify and monitor a spectrum of odorants in real time with a much higher selectivity and specificity than present electronic devices'.

Nicola Burton

Relief from painful blood tests offered by non-invasive method

## Holographic sensor for glucose

UK scientists have made a holographic sensor that could be used to continuously monitor blood glucose levels in people with diabetes.

Adrian Horgan, Kathryn Dean and colleagues at Smart Holograms, a start-up company based in Cambridge, UK, have developed a sensor that selectively measures glucose concentrations in the presence of other blood sugars, such as fructose.

The sensor is a crosslinked polymer that contains phenylboronic acid groups, to which glucose binds differently than other sugars in the presence of amine functions, said Horgan.

A hologram is imprinted into the polymer using a laser, leaving a regular arrangement of silver fringes, explained Dean. When the polymer is placed in a glucose solution, it contracts, changing the spacing of the fringes and the colour

of reflected light from green to blue. For other sugars, the polymer expands giving a colour change of green to red. A quantitative result, for diagnostic purposes, can be obtained by measuring the wavelength of the light, said Dean.

Holographic sensors have many advantages over current methods used to monitor blood glucose levels, which rely on blood being drawn intermittently from the finger-tip of the patient, explained John Pritchard, Chief Technical Officer at Smart Holograms. 'The holographic sensors are flexible, making them easy to incorporate into contact lenses or catheters,' said Pritchard. 'Using this technology it may be possible to take measurements painlessly on an intermittent basis with a mobile phone or in a minimally-invasive manner on a continuous basis.'

Andrew Mayes, an expert in holographic sensors at the



**The polymer is laser imprinted with a hologram**

University of East Anglia, UK, said the work looked promising, 'the method looks like it should be very effective - it operates in the correct concentration range under physiological pH and salt concentrations,' he said. 'The results demonstrate an appropriate lack of cross-reactivity to sugars that might be present in physiological samples.'

The sensor can be sterilised and the different components are biocompatible, explained Horgan, but the next hurdle which faces the devices are toxicological tests and clinical trials in humans.

'In three years, the holographic sensors could be available to people with diabetes as an easy and reliable way to monitor glucose concentrations in the blood,' said Pritchard.

Alison Stoddart

### Reference

K E S Dean et al, *Chem. Commun.*, 2006 (DOI: 10.1039/b605778k)

## Vaporising samples means small amounts can be measured

# Detecting trace metal impurities

Analytical chemists in Belgium have developed a direct solid sampling method for the analysis of metal impurities in high-purity semiconducting polymers.

Martín Resano and co-workers at Ghent University, Belgium, were asked by Solvay Research and Technology, an international chemical and pharmaceutical group headquartered in Brussels, to assist in their routine analysis of metal impurities in fluoropolymers. Resano said the challenge to develop a faster and simpler method 'was a very interesting application, very well suited for the characteristics of electrothermal vaporisation ICP-MS'.

To be used as in the semiconductor industry, these polymers must be extremely pure. Metallic impurities are normally monitored using inductively coupled plasma mass spectrometry (ICP-MS). However, because ICP-MS requires a dilute aqueous sample, the polymers need to be



pre-treated, which is often time-consuming and can result in analyte losses and contamination.

To avoid this, Resano used electrothermal vaporisation for sample introduction. Small pieces of the polymer are loaded into a graphite tube and placed inside a furnace which is heated

**The fluoropolymers must be extremely pure**

electrothermally. The matrix is completely removed at 800°C prior the volatilisation of the seven metal analytes of interest. This enables extremely sensitive multi-element analysis by a simple external calibration with aqueous standard solutions.

'Such a straightforward analysis of solid samples is not readily possible by laser ablation, which in any case does not allow *in situ* separation of the analytes from the matrix,' said Diane Beauchemin of Queen's University, Kingston, Canada. 'This technique has great potential since it should be applicable to aqueous and solid samples where analyte levels would be high enough for direct detection by ICP-MS but interference arising from the matrix precludes direct analysis.'

*Debora Giovanelli*

#### Reference

M Resano *et al.*, *J. Anal. At. Spectrom.*, 2006 (DOI: 10.1039/b602606k)

## Door open for other purification processes

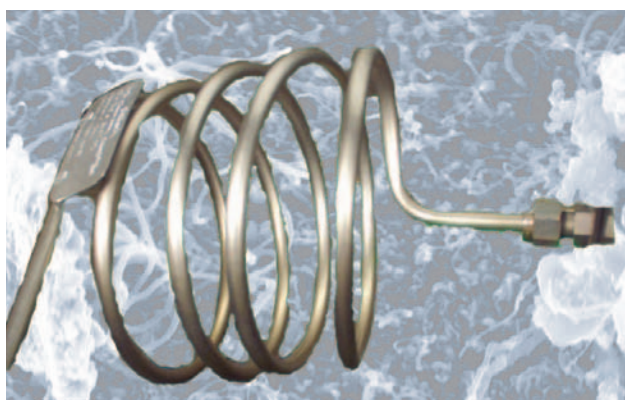
# GC separation with nanotubes

Devices lined with carbon nanotubes will improve industrial separation processes, claim researchers in the US.

Somenath Mitra and colleagues from the New Jersey Institute of Technology have made single wall carbon nanotubes (SWCNTs) inside a long capillary tube, and demonstrated their use as gas chromatography (GC) columns.

Mitra developed a simple and quick method to self-assemble SWCNTs inside long silica-lined steel capillary tubes. He used the lined capillary tubes to successfully separate a variety of analytes, such as hydrocarbons. The reproducibility in retention time of the columns was comparable with commercial GC columns.

The SWCNTs are self-assembled by a single catalytic step that takes



about 15 minutes to complete. 'The extremely high surface area of nanotubes means that volatile compounds can be separated. Nanotubes can also give high-resolution separation and extend the range of compounds that can be

**The carbon tubes self-assemble inside the column**

separated,' said Mitra.

The self-assembly of SWCNTs inside large structures is a significant step, said Mitra. 'This approach will open the door to larger scale applications of SWCNTs in a variety of chemical separations and processing, such as air pollution control, water purification and gas separation.'

Hundreds of tons of carbon are extensively used in the chemical industry. 'It is envisioned that the ability to fabricate nanotube coated structures will eventually replace traditional activated charcoal and related sorbents in many industrial-scale applications,' Mitra said.

*Ruth Needham*

#### Reference

M Karwa, Z Iqbal and S Mitra, *J. Mater. Chem.*, 2006, **16**, 2890

# Essential elements

## The best get better

Impact factors of RSC Journals have risen by an average of 10%, according to newly-released ISI® figures\*. Among the success stories is *Chem Soc Rev*, the general chemistry review journal: its impact factor rose by 27% to 13.7, placing it amongst the most highly cited review journals. Meanwhile *CrystEngComm* became the leading European journal in crystal engineering, with an impact factor of 3.5. *Dalton Transactions* remains the leading European general inorganic chemistry journal, while *Journal of Materials Chemistry*'s impact factor rose by a staggering 36%. *Organic & Biomolecular Chemistry*, now with an impact



factor of 2.5, is confirmed as one of the leading European journals in the field. Finally *Lab on a Chip* consolidated its position: at 5.3, it is the second highest impact journal in

the area of nanoscience and nanotechnology.

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\*Data based on 2005 Impact Factors, calculated by ISI®, released June 2006

## And finally....

*The Analyst* is updating its scope to place greater emphasis on detection science, it has been revealed. Detection science - is it revolution or evolution?

The way we perceive analytical science is being revolutionised by the emergence of new areas. From diagnostic kits and the human genome project to homeland security, they bridge the gap between conventional analytical chemistry and fast moving fields like miniaturisation, sensors and detection. Often the scientists involved are from entirely different communities and don't necessarily regard themselves as analytical.

Certainly when you look through *The Analyst* archive, detection has always been present. 'Detection science is central and enabling to all science not just chemistry', says Editorial Board member Duncan Graham from the University of Strathclyde, '*The Analyst* is the natural home for the latest approaches to acquiring data across the scientific spectrum'. Michael Thompson, scientific editor from the University of Toronto adds 'the journal has consistently represented the best work published in the field of analytical chemistry'.

With over a century of experience, the journal remains true to the evolving needs of this community. What ever the future direction you can be sure that *The Analyst* will be leading the way.

For more about *The Analyst* visit: [www.rsc.org/analyst](http://www.rsc.org/analyst)

## One small step for Soft Matter...

...one giant leap for interdisciplinary research. *Soft Matter* will separate from its host and become a solo publication in January 2007, it has just been announced.

Until now *Soft Matter* has been physically bound to print issues of *Journal of Materials Chemistry*, where it complemented the content of the top weekly materials research journal. Online hosting of *Soft Matter* in *Organic & Biomolecular Chemistry*, *Physical Chemistry Chemical Physics* and *Lab on a Chip* ensured the new journal received maximum attention from a broad and interdisciplinary audience right



from the beginning.

These efforts have been fruitful: *Soft Matter* is already recognised as a major player in the soft matter field.

Editor, Carol Stanier explains, 'The move away from publication with *Journal of Materials Chemistry* is just one small step in our evolution - but with far reaching effects for research in the soft matter community. We believe our journal has made a giant leap in bridging the gap between researchers working at the fringes of the traditional disciplines of physics, chemistry, and biology.'

To find out more visit: [www.softmatter.org/smallstep](http://www.softmatter.org/smallstep)

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