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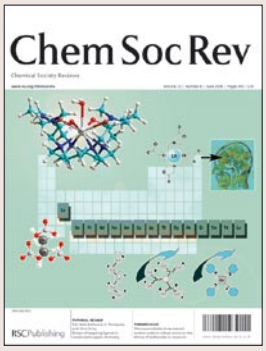
Chemical Technology

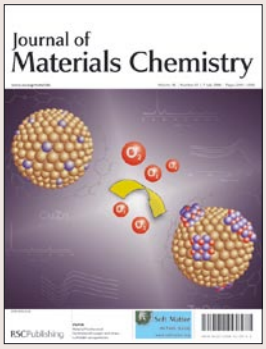
Nanotubes to the rescue



Carbon nanotubes could hold the key to chemical weapons detection, claim US navy scientists, as molecules adsorbed onto their surface alter their electronic properties. A 2D network averages the properties and reduces signal noise.

E S Snow, F K Perkins and J A Robinson
Chem. Soc. Rev., 2006 (DOI: 10.1039/b515473c)

Polymers detecting explosives



Glowing polymers that dim in the presence of TNT may lead to easier ways of detecting explosives. US chemists have developed a silicon-containing polymer whose luminescence is turned off when it binds to molecules of an explosive.

S J Toal and W C Trogler
J. Mater. Chem., 2006 (DOI: 10.1039/b517953j)

Finding the phosphorescent fungi

Researchers in Spain have developed a simple and rapid method for detecting toxic fungi in contaminated food products. The method uses phosphorescence rather than fluorescence, over which it has better selectivity and is much faster.

T Rojas-Durán *et al*
Analyst, 2006 (DOI: 10.1039/b604139f)

Brilliant synchrotrons

State-of-the-art synchrotrons, such as Diamond in the UK, will offer enormous opportunities for unravelling complex structures and understanding chemical processes on relevant timescales.

J Evans
Phys. Chem. Chem. Phys., 2006, **8**, 2797

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Application highlights

Dual channel instrument measures the radicals that cause pollution

Understanding ozone by peroxy

Environmental scientists in the UK are improving the understanding of how compounds that form ground-level ozone, which can damage crops and affect human health, relate to sunlight and pollution.

Claire Reeves of the University of East Anglia and collaborators refined a technique that turns the very low atmospheric concentrations of ozone-creating peroxy radicals into something measurable. 'Peroxy radicals are very short-lived thus their concentrations vary a lot both in time and in space,' Reeves said.

Unfortunately, the amplification technique relies on subtracting a noisy background signal from the amplified signal. Reeves said 'we therefore developed a dual channel instrument which allows both the background and amplification signals to be monitored continuously, thus increasing the frequency of measurement and reducing the noise.'

The technique amplifies low levels of radicals

Dwayne Heard, an atmospheric chemist at the University of Leeds, UK, appreciates Reeves' findings. 'Achieving shorter averaging times yet maintaining good signal-to-noise the instrument shows clearly the relationships between concentrations of peroxy radicals, sunlight intensity and levels of pollution,' said Heard.

The instrument will be flown over West Africa this summer, an area believed to be responsible for major emissions of biogenic compounds, according to Reeves. The air sampled by a fast-moving aircraft can change greatly over a short time.

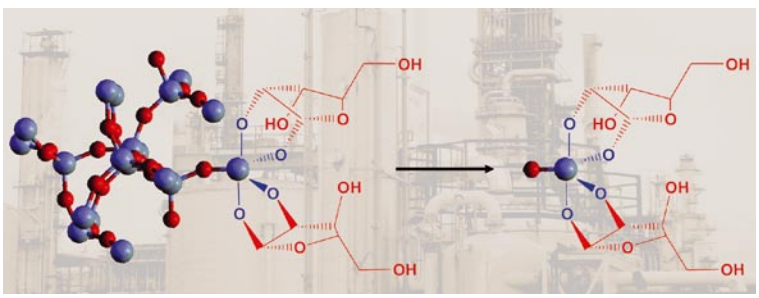
'The new dual channel instrument has thus allowed us to collect good peroxy radical data with low signal to noise ratios that would have been impossible with our previous single channel instrument,' said Reeves. Future challenges include producing smaller instruments that can be deployed on commercial aircraft, thus increasing coverage, she added.

Colin Batchelor

Reference
T J Green *et al*, *J. Environ. Monit.*, 2006, **8**, 530

Fructose and weak base break up silicates in simple reaction

Silicates sweet on petrol extraction



Silicates and sugar are both extremely common

The petroleum industry will benefit from research on silicate digestion, claim researchers in the US.

Joseph Lambert and colleagues at Northwestern University have devised a 'practical, economic, and environmentally friendly method' to break up silicates. Petroleum is extracted from silicate formations in the earth's crust and silicates are important for producing starting materials for the silicon electronics industry.

Lambert and his team used the sugar fructose and a weak organic base mixed with a chelating agent to break up silicate minerals. This avoids the need for corrosive chemicals like hydrogen fluoride which are currently used to remove petrol from silicates.

Lambert was surprised by the simplicity of the reaction. 'Silicates are the most widespread inorganic material in the lithosphere, and sugars constitute the major weight of organic materials on Earth. It is amazing that chemical reaction of the two most common inorganic and organic materials...was unknown to chemistry until recently.'

According to Vera Kolb at the University of Wisconsin-Parkside, US, this is 'a truly important advancement in the process silicate removal from the environment.' However, Kolb said that further development is needed to control the silicate dissolution.

For Lambert there are many avenues left to explore. 'There is the intriguing possibility that the reaction of sugars with silicate minerals was important in the development of life in the prebiotic phase of our planet,' he said. 'Could silicates play a role in stabilising ribose and fructose during prebiotic synthesis, or rendering them non-volatile during interplanetary transport to Earth, for example, on meteorites?'

Katie Gibb

Reference
G Lu *et al*, *Green Chem.*, 2006, **8**, 533

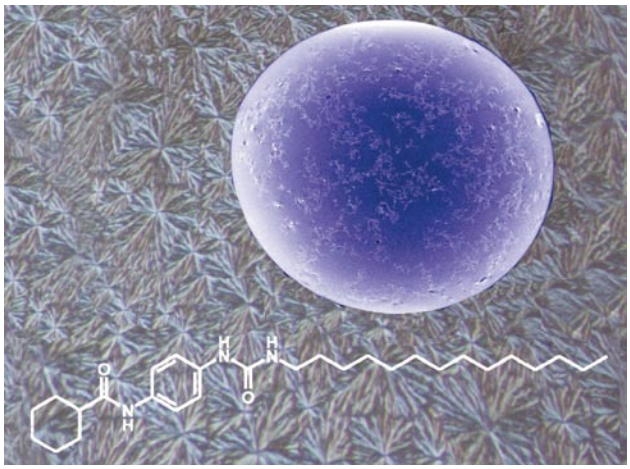
Urea-based gelator works at lower temperatures and concentrations

Making light work for ionic liquids

Solar cells using ionic liquids as electrolytes are a step closer, thanks to an efficient organogelator developed by European scientists.

Hans-Werner Schmidt at the University of Bayreuth and colleagues have developed an organogelator which can effectively gel mixtures of ionic liquids without affecting their performance in solar cells. The urea-based organogelator is effective even at a loading of only two per cent, half the amount previously needed, said Schmidt.

Incorporating the organogelator into ionic liquid mixtures gives an electrolyte which stays fluid at high temperatures, enabling it to be introduced into the cell. The mixture gels at lower temperatures, which is important for mechanical stability, according to Schmidt.



Even greener solar cells could be on the way

Testing of the new cells showed that addition of the organogelator did not affect their efficiency.

Ionic liquids are a promising choice as 'green' electrolytes in solar cells due to their low volatility and toxicity, but they need to be gelled in order to work effectively. Schmidt is optimistic about the future and said that the photovoltaic performance of these cells renders them 'a very attractive concept ... for power generation'.

Niyasi Serdar Sariciftci, Chair of the Linz Institute for Organic Solar Cells, Austria, agreed, commenting that Schmidt's work 'opens up the industrial preparation of this type of solar cell by removing the obstacles of electrolyte stability and confinement'.

David Barden

Reference

N Mohmeyer *et al*, *J. Mater. Chem.*, 2006 (DOI: 10.1039/b604021g)

Mass spectrometry is used to measure ratio of ruthenium isotopes

Identifying contamination in groundwater

US geochemists have developed a technique for identifying sources of groundwater contamination.

Christopher Brown and colleagues at Pacific Northwest National Laboratory in Washington analysed ruthenium in the groundwater under a storage facility for high-level nuclear waste, the US Department of Energy's Hanford site. The results were used to identify when contamination occurred, which is important at the site, according to Brown. 'Differentiating between purposeful discharges and tank leaks is critical,' he explained.

The technique uses dynamic reaction cell inductively coupled plasma mass spectrometry to analyse ruthenium isotopic ratios in the groundwater. Brown said that the method is 'a simple and cost effective approach to measure ruthenium isotopic ratios in all but the most dilute aqueous samples.' The ratios can then be used to work out when the waste was generated.

Brown said the team were prompted by the discovery of a significant amount of technetium contamination in the groundwater under the storage facility. Technetium has a long half-life (over two thousand years) and will persist in the environment for a very long time. Technetium and ruthenium are both produced as fission products in nuclear reactors, Brown explained, but technetium is only produced as a single isotope so it cannot be used to determine when the waste causing the contamination was generated. However, ruthenium fission product isotopes have a similar mobility to technetium, are sensitive to reactor conditions and can be used to find when the leak occurred, he said.

Finding out when a leak occurred is critical

The team hope to expand their technique to look at other fission product isotopes. 'Using a multi-element isotopic approach, we might be able generate a groundwater flow model for the Hanford Site,' suggested Brown.

Stefaan Van Winckel of the Institute for Transuranium Elements in Karlsruhe, Germany, said the work was excellent, offering 'convincing and very useful results—touching such different fields as nuclear, analytical and geochemistry'.

Katherine Davies

Reference

C F Brown *et al*, *J. Anal. At. Spectrom.*, 2006, (DOI: 10.1039/b603012b)

Essential elements

250 good reasons to keep on reading

Journal of Materials Chemistry celebrates its 250th issue later this month. The issue, due to be published on 20th July 2006, sees this class-leading journal reach yet another noteworthy milestone. During its 16 years of publication there have been many exciting developments in the field of materials chemistry, with three Nobel Prizes awarded to pioneers in the field, and the emergence of new areas of research such as biomaterials and nanotechnology.

The journal has continually changed with the times and responded to the needs of the community; last year it became the first weekly journal dedicated to materials chemistry bringing you the latest research faster than ever before. The quality and scope of the journal have also made quite an impact. A future issue on molecular magnetic materials, builds upon the journal's highly regarded selection of highly focussed theme issues; the first, looking at computer modelling, was published in 1994 and was guest edited by Richard Catlow of the Royal Institution, London. *Journal of Materials Chemistry* has also been warmly supported by the materials community and enjoyed particularly close links with the Materials Discussions and Materials Chemistry conferences.

'We would like to thank our readers, referees and authors for their instrumental part in making each of these 250 issues' say chair of the editorial board, Maurizio Prato, and editor, Carol Stanier, in the 250th issue editorial, 'to celebrate this great achievement and to thank our readership for their support, we are delighted to be making the 250th free to access for all, until 31st August 2006.'

To read this issue or to find out more about Journal of Materials Chemistry, please visit: www.rsc.org/materials

PCCP—going weekly, thinking nano

Delegates at the Bunsentagung 2006 meeting held in Erlangen on May 25-27 joined the editorial staff and Editorial Board of *PCCP* in celebrating weekly publication of *PCCP*. Professor Dr Jürgen Troe, Past Chairman of the *PCCP* Editorial Board, reviewed the remarkable growth of the journal since its start in 1999 and toasted the journal's future success.

Over the coming months *PCCP* will publish a timely series of themed issues on nanoscience and nanotechnology.

Nanotechnologies are widely seen as having huge potential in diverse areas from healthcare to energy storage, with

Celebrations at Bunsentagung

experimental developments being driven by pressing demands for new technological applications. In this special *PCCP* series Guest Editors Phil Bartlett (Southampton, UK), Tim Jones (Imperial, UK) and Paul Mulvaney (Melbourne, Australia) deliver a superb mix of urgent communications, full research papers and key reviews focusing on the physico-chemical aspects of nanoscience. Published in selected printed issues of *PCCP* (starting this month) and collected together on a dedicated webpage, explore the exciting and expanding world of nanoscience and nanotechnology with *PCCP*.

Visit the website to read the latest contributions and to sign up for RSS feeds – the best way to get the latest research news delivered directly to your PC.

Full details are at www.rsc.org/pccpnano

And finally....

Downloadable ChemDraw files and links to databases including PubChem are among the additional online features on offer to authors and readers of *Molecular BioSystems*.

The journal, which publishes at the interface between chemistry and biology, has recently celebrated a successful first year of publication.

It also boasts rapid publication times, RSS feeds, graphical abstracts for Advance Articles and Table of Contents lists as well as other features and benefits associated with RSC journals.

Full details are at www.molecularbiosystems.org

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