Chemistry Update

Newsletter 306, 22 February 2019

Inside this Issue

Calendar of Events

UCAS Post-Offer Visit
Date: Tuesday 26 February
Time: 12pm—4pm

Organic Seminar
Speaker: Prof Hon Lam, University of Nottingham; Dr Robert Phipps, University of Cambridge
Date: Wednesday 27 February
Time: 1pm—3pm
Location: C/B101

UCAS Visit
Date: Monday 4 March
Time: 12pm—4pm

Physical Seminar
Speaker: Prof Anthony Meijer, University of Sheffield
Date: Wednesday 6 March
Time: 1pm—2pm
Location: C/B101

E&D Beacon Seminar: My journey with Athena: looking back over 20 years' work on women in science
Speaker: Sean McWhinnie
Date: Thursday 7 March
Time: 1pm—2pm
Location: C/B101

Inorganic Seminar
Speaker: Dr Katherine Holt, University College London
Date: Wednesday 13 March
Time: 1pm—2pm
Location: C/B101

Serendipitous Science: Accidental discoveries that changed the world
Speaker: Dr Annie Hodgson, University of York
Date: Thursday 14 March
Time: 6.30pm—7.30pm
Location: C/A101

Equality and Diversity Lunchtime Forum:
Being a BAME Chemist: what could the Department do better to support students and staff?
Date: Friday 15 March
Time: 1pm—2pm
Location: C/A107

Departmental Teaching & Learning Seminar
Speaker: Prof Tina Overton, University of Leeds
Date: Wednesday 20 March
Time: 1pm—2pm
Location: C/B101

RSC Organic Section North East Regional Meeting
Speakers: various
Date: Wednesday 27 March
Time: 9am—5pm
Location: C/A101, C/B101, C/B102

Salters' Festival of Chemistry
Date: Thursday 28 March
Time: 10am—4pm
Location: YSOC

Date of Next Issue:
29 March 2019

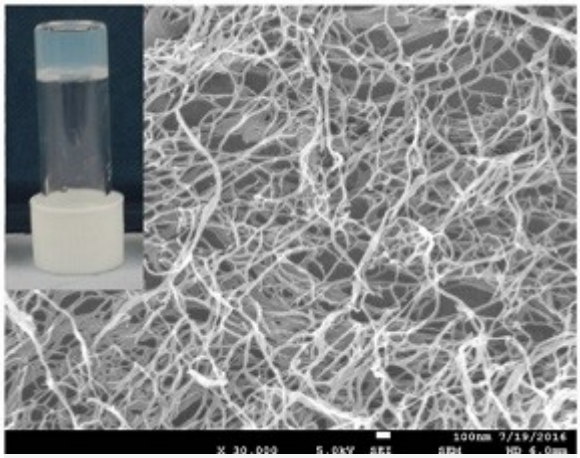
A simple recipe for highly conductive gels

Gels self-assembled by simply mixing sustainable, commercially-available ingredients have high conductivities and great potential for use in energy technology.

In recently published research, Professor David Smith and his research team have developed innovative conductive gels based on mixing simple commercially-available building blocks. Their gels are formed in 'deep eutectic' solvents, which are liquids created by mixing together two simple environmentally-friendly solid components.

Deep eutectic solvents are known to have high conductivity as a result of their ionic composition, but their use as electrolytes in energy applications such as batteries and solar cells is limited because of the risks of liquid leakage. In principle, however, 'solidified' versions of these liquids that retain their high conductivities, would be much easier to handle and both safer and simpler to use.

The Smith group has developed 'supramolecular eutectogels' from these deep eutectic solvents, which retain the high conductivities of the original liquid, but in 'solid-like' form. Their innovative step is to generate gels by simply mixing in a small-molecule additive, 1,3:2,4-dibenzylidenesorbitol, which is also commercially available. This molecule self-assembles into nanofibres that form a network through the deep eutectic solvent. While this network prevents the flow of the bulk liquid, it allows the individual ions to retain their mobility on the molecular scale. This means the ions diffuse effectively unhindered through the gel structure, and hence the conductivity is retained.



Supramolecular eutectogel based on a commercially-available additive that self-assembles into a nanoscale gel network in a sustainable conductive liquid.

Although there have been a limited number of previous reports of gels formed in deep eutectic solvents, this is the first time gelation has been achieved using the reversible self-assembly of a simple, cheap, low-molecular-weight additive. This approach makes these gels thermally reversible, highly tunable and ensures their low-cost and easy use.

The authors also went on to demonstrate that these gels could withstand high concentrations of lithium ions, and once again, retain their conductivity profiles. This suggests potential applications of this simple approach in next generation lithium ion battery technology.

Professor Smith said: 'The low-cost nature of this system is particularly attractive – all components of the system are commercially available, cheap and sustainable. In principle, these gels could be directly applied in energy technology with very little further development.'

Professor Smith is part of the newly-formed Molecular Materials group in the Department of Chemistry, which focusses on developing innovative technologies based on molecular-scale engineering of a wide-range of materials systems. In particular, the group targets applications ranging from tissue engineering and drug delivery to opto-electronics and battery technology.

The research was funded by the European Union through a Marie Curie Action and was carried out in the lab by researchers from Spain (Dr Jorge Ruiz-Olles), The Czech Republic (Dr Petr Slavik) and Scotland (Dr Nicole Whitelaw). The research paper is published in *Angewandte Chemie*.

Dr Jacqui Hamilton awarded NERC discovery grant

Dr Jacqui Hamilton was awarded a NERC discovery grant "COMPLEX-SOA: Using the complexity of secondary organic aerosols to understand their formation, ageing and transformation in three contrasting megacities" in collaboration with Dr David Topping at the University of Manchester.

Exposure to poor air quality is the top environmental risk factor of premature mortality globally. By far the most damaging air pollutant to health is particulate matter, with the greatest effects associated with particles less than 2.5 microns in diameter (PM2.5). Secondary organic aerosol (SOA) can make up a significant fraction of PM2.5 in urban areas. Current analytical approaches fail to provide sufficient chemical speciation to routinely apportion the contributing sources of SOA, limiting the opportunities to develop more targeted PM abatement strategies. This project will develop new tools and methods to investigate the sources of secondary organic aerosol in urban atmospheres, working alongside project partners at King College London, Reed University and the Department for Food and Rural Affairs. This project will provide evidence of the key factors that control the amount of SOA in cities, using London, Beijing and Delhi as test cases. However, the methodology could be applied in cities across the globe to develop abatement policies that would target SOA reduction.

Dr Glenn Hurst gives invited talk at QMUL

On Monday 4 February, Dr Glenn Hurst gave an invited talk at Queen Mary University of London (QMUL). Glenn discussed his innovative use of social media together with the development of resources for game-based learning. Glenn also outlined his work in international green chemistry education. As a result of his work in this area, he has been invited to participate in an IUPAC project on Systems Thinking In Chemistry Education (STICE).

While in London, Glenn met up with collaborators from University College London to discuss progress made in teaching polymer chemistry at the undergraduate level.

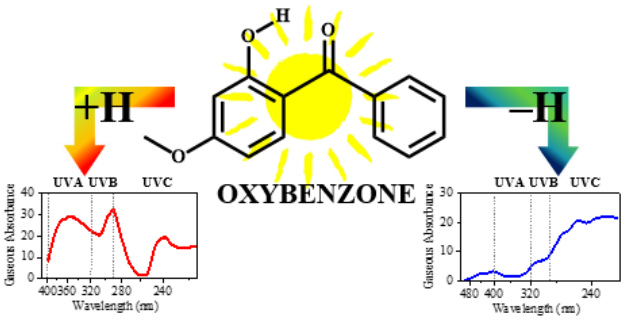
Illuminating sunscreens!

The first paper from the Dessent group on sunscreens has been published this month in *Physical Chemistry Chemical Physics*. Important new insights into the photoabsorption properties of popular sunscreen molecule oxybenzone are presented and its suitability as a key active sunscreen component commonly found within commercially-available sunscreen formulations are discussed.

L-R: Natalie Wong, Dr Jacob Berenbeim and Dr Caroline Dessent

The study employs the group's novel technique, laser-interfaced electrospray ionization mass spectrometry (LIMS), to investigate the intrinsic UV absorption properties and photodegradation products of the protonated and deprotonated forms of oxybenzone. These studies, led by PhD student Natalie Wong and PDRA Dr Jacob Berenbeim, provide a route to understanding the effect of pH on sunscreens at the molecular level. The paper reports that protonation state has a dramatic effect on the photoabsorption and photodegradation properties of oxybenzone, with the deprotonated molecule in particular absorbing significantly less UV across the UVA region.

The unique experimental approach of LIMS, based within The York Centre for Laser Spectroscopy and Photochemistry, allows for the direct mass-spectrometric identification of photoproducts as a routine part of the experiment. For oxybenzone, it is observed that both protonated and deprotonated oxybenzone photodissociate *via* distinctive pathways, with protonated oxybenzone predominantly fragmenting with rupture of the bonds around the central carbonyl group, while the deprotonated form fragments with either the ejection of methane or a methyl radical.



This research is funded by a Leverhulme Trust Research Project Grant, which also supports further collaborative work with Dr Martin Cockett's group, where a new instrument is being constructed to study organic sunscreen aggregates featuring inorganic particulates, such as TiO_2 and ZnO, bound to organic sunscreens.

The *PCCP* paper "Illuminating sunscreens: New approaches to a molecular understanding of photoprotection" can be downloaded from the RSC website.

Online Department suggestion box

The online Equality and Diversity suggestion box has been extended to be a suggestion box for the whole Department. You can submit your thoughts/suggestions/ideas for general Departmental matters as well as matters relating to Equality and Diversity. You can find the Google form on the intranet homepage or at this link.

Chemical Interactions update

Chemical Interactions has organised a variety of events over the last few months, largely thanks to the hard work of the committee and our continued financial support from the Royal Society of Chemistry (RSC). Here is a selection of the events that have taken place:

Termly coffee and cake mornings: open to anyone in the Department, the aim is to encourage interaction between various groups and enable people to meet others in the Department with whom they may not otherwise cross paths.

Networking Techniques session and a Careers symposium: these two events were aimed at postgraduate students and postdocs. Both hosted by Leonie Jones, the first event provided an opportunity to learn and practise a variety of networking tips and techniques to put into action at other events. The symposium saw a selection of speakers talk about their career paths, as well as general careers guidance from Leonie.

Charity Quizzes: 2018 saw two Charity Quizzes take place, organised mainly by Jenny Lewis and Emma Stanbury, raising money for St Leonard's Hospice in memory of Robin Virgo. The Summer Quiz was a smart phone speed quiz, while the Christmas quiz was a more traditional affair with quiz master extraordinaire Jason Lynam. Both events were very well attended.

MChem Welcome and Advice Session: a new event for the group, and led by Nina Leeb, this event was aimed at MChem students just starting their final year in York. There were talks from a few PhD students who had done their MChem at York, offering words of wisdom and advice based on their experiences, followed by refreshments and chance for networking and further questions.

Chemistry Christmas Party: the Chemical Interactions group have also taken over the organisation of the Departmental Christmas Party from securing the venue, selling tickets, arranging menus and drinks, and generally ensuring everyone who attends has great night. This event is generously supported by the Department of Chemistry.

Future events

Meet the Demonstrator: following the success of a similar event a number of years ago this session, organised by Mark Dowsett, will involve flash presentations from some of our demonstrators to an audience of undergraduate students. This will enable undergraduate students to find out a bit more about the PG students who spend time with them in the lab, and hopefully provide an opportunity to share knowledge, experiences and understanding across the groups at the networking session afterwards.

Also in the pipeline... we hope to secure plans for a variety of talks in the coming months covering careers, equality & diversity, mental health and wellbeing etc. Look out for posters about our events.

If anyone would like to be involved in the Chemical Interactions group, or has any ideas / suggestions for future events, please get in touch at chem-interactions@york.ac.uk.

GCCE graduate wins Oman National Research Award

Green Chemistry of Excellence (GCCE) graduate Dr Karima Al Bulushi has won an Oman National Research Award 2018. The monetary value for the prize is 1000 OMR (around £2000).

Karima's paper entitled "Optimisation and economic evaluation of the supercritical carbon dioxide extraction of waxes from waste date palm (Phoenix dactylifera) leaves" was published in *Journal of Cleaner Production*. It was co-authored by her GCCE supervisors Professor Michael North, Dr Andrew Hunt and Dr Thomas Attard.

The paper was awarded "Best research work in Environment and Biological Resources Sector for the year 2018" in Category II (Best published research by a young researcher) by the Oman Research Council.

Karima completed her PhD in the GCCE in 2018.

Presentation by final year project students at national chemical safety conference

L-R: Dr Moray Stark, Alix Howells and Aimilia Tsokou

Aimilia Tsokou, currently a final year MChem project student, and Alix Howells, recently graduated from the Department of Chemistry, along with Dr Moray Stark, gave a joint presentation on *Measuring Chemical Spills by Students, a Randomised Controlled Trial of Providing Feedback* at the University of Edinburgh's XXIIIrd Meeting of the University Chemical Safety Forum on 6 February.

The work reported quantifies the ability of students handle chemicals safely, and aims to provide them with an understanding of the possible consequences of the chemicals they spilled. Also presented were results of a randomised controlled trial investigating whether providing students with feedback on the chemicals they spilled had an effect on their subsequent ability to handle chemicals safely.

The Princess Royal visits University of York for launch of BioYork

Her Royal Highness The Princess Royal visited the University on 15 February to participate in the launch of BioYork, our new bioeconomy initiative.

The Princess Royal meeting with senior University staff

BioYork has been established as a focus for bioeconomy activity in the North of England as part of an interdisciplinary approach to research into health, food and bio-based fuel and chemicals.

The bioeconomy refers to all economic activity originating from products and processes made with renewable bio-based resources.

BioYork will translate cutting-edge research into technologies, processes and products to address the major 21st-century challenges of healing, feeding and fuelling the world:

- **Heal**: Novel uses of nature's solutions for healthcare and pharmaceuticals
- **Feed**: Improving the productivity, sustainability and nutritional value of food
- **Fuel**: Developing new sources of bio-based fuels and chemicals

During her visit, The Princess Royal met senior University of York staff behind the initiative, including Professor Duncan Bruce, and toured the University's research facilities.

Our Green Chemistry Centre of Excellence and the Biorenewables Development Centre have been particularly involved with the initiative.

You can read more about the Princess Royal's visit on the University of York website.

New starters

Chris Horbaczewskyj, Research Technician for Automated Chemical Reaction Screening with Professor Ian Fairlamb
Room: C/E102; Ext: 2584; Email: chris.horbaczewskyj@york.ac.uk

Dr Alfiya Suleymanova, PDRA with Professor Duncan Bruce
Room: C/E202; Ext: 2593; Email: alfiya.suleymanova@york.ac.uk

Dr Harriet Chidwick, PDRA with Dr Martin Fascione
Room: C/B016; Ext: 8822; Email: harriet.chidwick@york.ac.uk

Athena SWAN Gold Award

DEPARTMENT OF CHEMISTRY
york.ac.uk/Chemistry

UNIVERSITY of York

Equality and Diversity Beacon Seminar

Dr Sean McWhinnie

My journey with Athena

looking back over 20 years' work on women in science

Thursday 7 March

1-2 pm, C/B101

It's 20 years since the Athena Project was launched and it is 20 years ago that Sean McWhinnie, then working at the Royal Society of Chemistry, began addressing the question of why women were so badly represented at the higher levels of academic chemistry.

Sean will look back over the last 20 years and reflect on some of his research on women in academic and industrial chemistry. He will compare the representation of women in chemistry 20 years ago with their representation today and consider some of the challenges ahead.

All staff and students welcome

Please contact leonie.jones@york.ac.uk or caroline.dessent@york.ac.uk for more information

Athena SWAN Gold Award

DEPARTMENT OF CHEMISTRY
york.ac.uk/Chemistry

UNIVERSITY of York

Equality and Diversity Lunchtime Forum

Being a BAME chemist:

What could the Department do better to support BAME students and staff?

All staff and students welcome

Come along to chat and share your experiences.
Meet others in the Department who are interested in equality and diversity.

Friday 15 March

1-2 pm, C/A107





Bring your lunch and a mug - tea and coffee provided

Please contact leonie.jones@york.ac.uk or avtar.matharu@york.ac.uk for more information