



KNOWLEDGE CENTRE
**MATERIALS
CHEMISTRY**

KCMC NEWSLETTER 2015



Dr John Conti-Ramsi,
KCMC Director

Rebuilding our materials supply chains

KCMC works with manufacturing companies and supply chains to understand their materials chemistry needs. In the past few months we have had a particular focus on materials for energy and composites – this understanding will be of value to the UK's economy, both in terms of accelerating materials innovation in commercially valuable directions, and improving our manufacturer's products, from more fuel efficient cars to wind turbines for harsh offshore environments.

Our ability to understand the market and shape research directions is improving as we expand our reach and become ever more connected through our partners and the KTN.

This expansion has just received a big boost as we welcome Bristol as a new KCMC partner (see pages 3-4). Bristol has a big focus on composites with particular expertise in self-healing and energy materials. They are contributing hugely to our mapping of materials needs including those of long fibre-reinforced composites, which, as we mentioned in the previous newsletter, have wide-ranging potential applications.

A happy new year to all our colleagues and collaborators

Areas of material interest

Automotive in particular remains a big driver for such composites, as well as for other materials innovations, with its needs to improve fuel efficiency. Lightweighting, catalytic converters, thermoelectrics for turning waste heat into electrical energy, improved lubricants and power electronics are all active areas of research being promoted by this industry and its supply chain.

Advanced computational modelling to understand new materials is also attracting a lot of our attention – offering opportunities across materials supply chains in all sectors. The Liverpool Materials Innovation Factory, due to open 2017, will be a big boost to the UK in this field.

Looking at the materials themselves, graphene continues to cause much excitement. The KCMC had the honour of hosting one of the first industry meetings at the National Graphene Institute at The University of Manchester, which is now open for business. We hosted an industry meeting with the Innovate UK High Value Manufacturing (HVM) team, looking at the opportunities and challenges for new materials, which will feed into the next version of the HVM strategy.

Materials continuing to generate excitement

Research investment in new materials continues to grow in areas important to the future development of the UK economy, with some great funded projects being pursued in surface engineering, advanced coatings, agritech, solar fuels and composites (see pages 8-10 for more information on current and upcoming opportunities).

With all these exciting opportunities, it was heartening to hear Sajid Javid, **Secretary of State for Business, Innovation and Skills**, speaking at Innovate UK in November on the importance of the role on universities for innovation and economic growth. This year's event also included a session on international opportunities for advanced materials, and heard from exciting materials innovators. All of which is promising for materials researchers and the industries they serve.

KCMC in the news



Professor Mohsen MirafTAB,
Professor of Fibre Science and
Technology.

Future funding landscape

New government decisions on spending are due shortly and with talk of more cuts, there is understandably some caution around whether funding priorities may change in the coming months.

There will always be times of uncertainty, but it's important to reiterate that materials chemistry remains an exciting and innovative area with huge potential for the UK economy, and the government shows an ongoing interest and commitment to it. As we highlight at the end of this newsletter, there are plenty of funding opportunities linked to current programmes, which will play an important role in supporting materials companies in the UK.

“Our ability to understand the market and shape research directions is improving as we expand our reach and become ever more connected through our partners and the KTN.”



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Over recent months, the media has been following some exciting materials projects which the KCMC has been involved in, and calling on our insight in materials chemistry.

Prof Mohsen MirafTAB, a KCMC partner, at the University of Bolton, has discussed how nature has inspired a range of bio-inspired materials that may change the way the human body heals itself in Engineering Materials (<http://bit.ly/1MHliuQ>) and Materials World (<http://bit.ly/1Ng47jx>).

New lightweight, durable materials being developed for a new generation of offshore wind turbines have created interest from the renewables media, being discussed by KCMC Director Dr John Conti-Ramsden is Director and Dr Kirsten Dyer from the Offshore Renewable Energy Catapult, in Renewable Energy Focus (<http://bit.ly/1OXX5CZ>), Renewable Energy World (<http://bit.ly/1frTduK>), and Power & Energy Solutions (<http://bit.ly/1hIS82v>).

Dr John Conti-Ramsden has also been spreading the word on the value of collaboration for innovation and the development of new materials, and for ensuring they contribute to academia, business and the economy. He has provided a guest post on the topic to Praxis Unico's blog (<http://bit.ly/1fPWGUJ>), was interviewed by The Manufacturer (<http://bit.ly/1LSj5Zo>) and discusses it at length on the Materials Today podcast (<http://bit.ly/1FOkiOq>).

Bristol up and running as new partner

University of Bristol joins KCMC

The University of Bristol has become the 6th KCMC academic partner, expanding the KCMC's geographic reach and the range of expertise available to partners through the Bristol's world-leading Chemistry Department.

Bristol brings particular expertise in composites and materials for energy, including experience of ground breaking research in self healing materials and biofuels, areas with significant interest from UK business in areas such as automotive and aerospace, as well as energy. Partners will also benefit from Bristol's strength in soft matter chemistry which has vast applications in consumer products such as cosmetics, detergents, food and other formulated products.

This is all backed up by very powerful equipment to support research in these fields, which industry stands to benefit from.

“We are very excited about the new research projects this will generate between us and industry.”



Duncan Wass, Professor of Catalysis at University of Bristol says:

“We’ve seen the KCMC model proven with other universities and we are very excited about the new research projects this will generate between us and industry.”

“We see the KCMC as brokers between industry and universities that can connect our expertise with businesses and entrepreneurs with materials challenges we can help solve. Bristol will provide an important piece of the jigsaw of UK materials chemistry

A welcome to Dr Colin Cooper



Dr Colin Cooper,
Knowledge Transfer Manager

The KCMC is pleased to welcome Dr Colin Cooper. Colin will be the Knowledge Transfer Manager for The University of Bristol. Here he will develop collaborative R&D projects between industry and Bristol's Chemistry Department. He will work closely with the department to create a more collaborative culture which creates closer ties to industry.

Colin trained at the University of Reading obtaining his PhD in Chemistry (Catalysis), followed by post-doctoral positions in the Universities of Reading, Surrey, Cranfield and Middlesex.

He brings extensive industry experience including assessing environmental technologies for investment, and in open innovation roles, initially for a startup consultancy then for Cadbury/Kraft Foods.

KCMC Director, John Conti-Ramsden, welcomes Colin, saying: **“Colin’s direct experience of industry and academia, and of running projects which combine both, makes him the perfect person for the role. He will be instrumental in ensuring Bristol gains maximum benefit from the new KCMC partnership and our network of companies benefits from Bristol’s expertise – all of which will be of great value to the UK’s innovative chemistry-using industries and the economy as a whole”.**

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Spotlight on Duncan Wass, Professor of Catalysis



Dr Duncan Wass,
Professor of Catalysis

Duncan Wass is Professor of Catalysis at the University of Bristol and will be a key name to watch as Bristol develops its role as a KCMC partner.

Duncan holds a PhD in polyolefin catalysis at Imperial College, London. He joined the University of Bristol in 2004 after six years with BP's polyolefin and olefin oligomerisation businesses.

As well as leading a large research group, he is Director of Research for the School of Chemistry and leads Bristol's activities in the EPSRC UK Catalysis Hub and CDT in Catalysis. His research interests include organometallic chemistry and homogenous catalysis, new processes for the upgrading of bio alcohols to advanced biofuels, and multifunctional structural composite materials, particularly materials with damage detection and self-healing capabilities.

Duncan said, **“Bristol’s involvement with the KCMC is a key strand in our strategy to build new collaborative projects. I know from my background in industry that having excellent relationships between industrial and academic partners is the most powerful way to deliver new science and technology with real relevance. Working with the KCMC is a great opportunity for us to share and build are expertise and capabilities in materials chemistry.”**

“Working with the KCMC is a great opportunity for us to share and build are expertise and capabilities”

Partner News: Liverpool

Catalysing materials interaction: an update from Liverpool



Dr Karen Linley,
Head of Impact and Research Partnership

A new focus is settling at the University of Liverpool, a focus on maximising the potential of Higher Education through greater partnership and engagement with industry. The woman responsible for providing academics with the support to deliver this new vision is Dr Karen Linley, the newly appointed Head of Impact and Research Partnership at Liverpool. Karen spoke to the KCMC about Liverpool's plan of bringing the academic expertise and infrastructure of the Chemistry Department to a commercial audience with more of a client focussed service.

Karen is not a typical University hire, an enthusiastic and engaging advocate for the value of Higher Education to British Industry she presents a highly credible face, a Chemist with over 25 years working for blue-chip companies (most recently as Head of Global Regulatory Affairs, then Open Innovation Director at Unilever) Karen now heads up a dedicated central team tasked with linking the Liverpool academic experts with commercial partners.

Straight out of the gate Karen is keen to cite Liverpool's recent achievements in the field of Chemistry, a multimillion pound open access laboratory space, climbing research income, hundreds of successful KTP and KE projects and an award winning spin out.

A catalyst for Liverpool's commercial partnerships is the new £68M Materials Innovation Factory (MIF), a partnership between Unilever, Liverpool and HEFCE initiated through the UK Research Partnership Investment Fund (UKRPIF).

Opening in 2017 the 11,500m² MIF will span four floors, with open innovation at the heart of its design. It will provide companies

with access to world-leading capability, contain the highest concentration of automated robotics for materials chemistry in Europe, run by a multi-disciplinary technical team to tailor support according to the needs of the customer. The MIF teams aims to become the world leader in Computer Aided Material Science (CAMS). This new facility compliments the existing £4m ERDF funded Open Innovation Hub for Antimicrobial Surfaces which opened this year.

Karen's focus is on fostering long term qualitative interaction between industry and academics. To do this she is employing her years of industry experience to bring a new degree of professionalism to the support services in the hope growing the number of small scale short term KTP, consultancy and KE projects into longer term and higher value partnerships and collaborations.

Karen is also looking for opportunities to support new commercial ventures. She points to the award winning Liverpool Chirochem, a start-up created by recent graduates and academics from the Department of Chemistry, and has attracted more than £500,000 in equity investment to accelerate its R&D, secured investment in China to establish a unique chemical analytics centre and won the Merseyside Innovation Award 2015 and most recent the Bionow start-up of the year award 2015, all in under 2 years.

Karen is looking to replicate these successes, and ensure the UK's businesses understand and benefit from Liverpool's extensive expertise. She is currently engaged in developing a strategy going forward for Liverpool's commercial engagement, which will be rolled out fully in the coming months.

Research Strategy with Industrial Impact



University of Liverpool, Professor
Matt Rosseinsky,
Materials Chemistry & KCMC
Primary Investigator



Professor Matt Rosseinsky, Materials Chemist and KCMC Primary Investigator at the University of Liverpool, has been appointed to the EPSRC Council for a five-year term. The Council is the senior decision making body, responsible for determining EPSRC's policy, priorities and strategy.

Professor Rosseinsky's experience with academia and business means he is well positioned to provide the EPSRC Council with valuable insight into the opportunities which materials chemistry presents to the UK economy.

The University of Liverpool carries out world leading research aimed at keeping the UK at the forefront of the global materials competition and earlier this year, a team led by Professor Rosseinsky was awarded £6.65 million by EPSRC to research new advanced materials for the energy sector, looking at designing and testing new materials at the atomic level.

The team are investigating materials for sustainable energy production and storage such as safer new battery technologies and the efficient capture and utilisation of solar energy. The project brings together specialists in prediction of the structures and properties of materials, in measurement and in materials synthesis, and will combine computation modelling with experimentation.

It is a prime example of a programme with impact at its heart, with approaches and discoveries set to be shared with commercial partners via the KCMC and the new Materials Innovation Factory.

Commenting on Professor Rosseinsky's appointment, Professor Ken Badcock, Executive Pro-Vice-Chancellor for Liverpool's Faculty of Science and Engineering, and institutional lead for EPSRC engagement, said: "It is important that our top scientists are active in influencing the strategy of EPSRC, with whom we have £57 million in active grants."

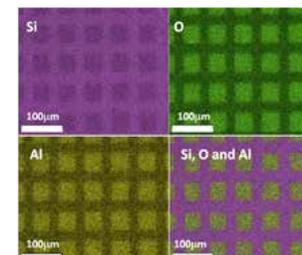
Manufacturing with Light



Researchers at the University of Liverpool have developed a novel photochemical Atomic Layer Deposition (ALD) manufacturing technology to extend the application of ultrathin functional materials in display electronics, biomedical devices, roll to roll barrier layers, plastic electronics and photovoltaics amongst others.

Professor Paul Chalker, Dr Richard Potter and Dr Chris Sutcliffe have completed a feasibility study to demonstrate that UV light can assist the activation of ALD chemical reagents to deposit thin films, reducing the dependence of the process on thermal energy and direct heating of substrates.

Further EPSRC funding has now been secured to modify reactor designs and enable the photochemically assisted deposition of ultrathin functional coatings on 3-dimensional components and feedstock powders. The team is also developing in-situ measurement techniques and using commercially available UV lamp modules to advance the technology to industrialisation.



Top: Professor Paul Chalker
Middle: Dr Chris Sutcliffe
Bottom: Dr Richard Potter

"Opening in 2017 the 11,500m² MIF will span four floors, with open innovation at the heart of its design"

Partner News: Manchester and Bolton

Manchester spin out develops new materials for health and electronics

Chromition

innovative solutions

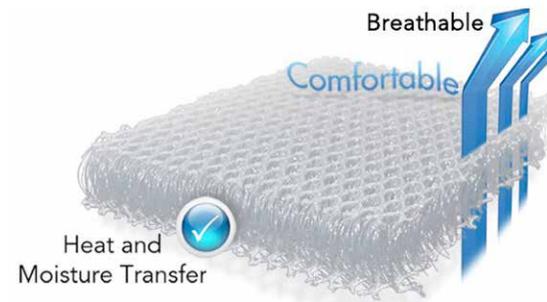
New materials company, Chromition, was spun out of The University of Manchester's Organic Materials Innovation Centre (OMIC) a year ago. It followed ten years of research within Professor Mike Turner's group into new materials with applications in bio-imaging, electronics, sensors and security printing.

A number of patents have been filed by the University of Manchester on new materials and processes, including commercialisable routes to conjugated polymer dispersions in water. The first materials to be commercialised by Chromition will be for bio-imaging applications. These Luminspheres™ are bright and fluoresce across the visible spectrum, even out into the near-IR. They are ideal for applications such as tissue staining for cancer diagnosis, but also have applications as anti-counterfeiting inks.

The optical properties of Luminspheres™ are promising for use as phosphors in lighting applications, as they are carbon based and can replace traditional phosphors that contain scarce rare earth elements. Related materials, Elecspheres™, can be printed or sprayed from water into films that form the active layer of electronic devices or sensors. These water based inks offer opportunities for companies to make their printed electronics processes more compatible with traditional printing processes and reduce the environmental impact of the process.

testing facilities. It even drew in cross department expertise, with equipment intended for testing concrete proving to be exactly what was needed for testing wheelchair cushion technology.

Airospring has been successfully patented and is now one of Baltex's most lucrative products. It is also bringing financial benefits to the NHS, which can spend up to £2.6bn a year treating pressure sores.



From research to business

This portfolio of IP formed the basis for spinning out the company in November 2014. It has spent the past year developing the underlying science and proving the product. This has been supported by funding from Manchester's Proof-of-Principle Fund and the EPSRC Impact Acceleration

Account, and through access to equipment and support at OMIC.

It is now looking for commercial partners and raising funding to take the products to the next stage, proving them in application areas, whilst also continuously improving performance.

The KCMC has been involved throughout, with KCMC project scientists working on the

technology's development. A key part of the commercialisation plan is to take advantage of the KCMC's networks to raise awareness and identify commercial partners, and to access to leading academic equipment and expertise to scale up the technology available through the KCMC.

www.chromition.com

From fire testing to materials chemistry



Professor Bajjinder Kandola has been appointed to the role of KCMC primary investigator for the University of Bolton, a partner institute of the KCMC since its inception. Here she discusses the importance and need to develop new heat and fire resistant materials and products to meet stringent fire regulations and engineering requirements for demanding applications.

Bolton has a unique laboratory in the UK with facilities to study the fire performance of materials and to develop and implement new fire test methodologies. Our

department also brings wide-ranging expertise in materials science – including research into mechanical properties, nano-structure level modifications and coatings – as well as in design and formulation of those materials, especially resins and matrices.

Together this offers huge value to a range of industries and sectors (including built environment, marine, oil and gas, rail and automotive) which work in high temperature environments or applications where there is a risk of fire. This is of particular interest in aerospace where improvements in efficiency are achieved by furthering the deployment of composite materials in nacelles and structures close to the engine-fire performance is a key component of such research.

Baljinder's group is also researching the use of composite materials sourced from biorenewable feedstocks to meet needs in developing more sustainable products with equivalent performance to those they seek to replace. We have long worked on projects to develop materials of direct commercial interest, working with companies

which are actively selling into manufacturing supply chains. The starting point is always a company with a well-defined materials challenge; we are not developing resins in isolation and hoping we can later find a use for them.

With Bristol bringing its expertise in composites and energy materials to the KCMC, there are great opportunities to draw together broad capabilities to address challenges in areas such as bio-composites and self healing materials. This allows the KCMC to make a really valuable combined offer to companies developing exciting new materials, and we are looking forward to some exciting collaborations in the near future.

Baljinder's expertise lies primarily in developing and evaluating flame retardant materials. She also teaches on subjects including technical textiles, composites, advanced materials and nanomaterials.



Materials collaboration to take the pressure

Advanced 3D-spacer textile technology – developed through an industry-academia collaboration – is helping wheelchair users and those in hospital beds avoid the pain of pressure sores, an unpleasant condition affecting people confined to a single position.

The Airospring pressure control cushion is the result of a collaboration between Bolton and technical textiles company Baltex.

Made from three to five layers of spacer fabric, each with different compression properties, it distributes pressure and allows maximum airflow to create a microclimate, which dissipates

perspiration, aids bloodflow, and promotes healthy skin.

The materials are also designed to be non-allergenic and provide contamination resistance and odour control.

The collaboration was developed following a number of successful previous products and a strong

working relationship between Charles Wood, Baltex's MD, and Professor Subhash Anand MBE at the University of Bolton.

The product's development and testing benefitted hugely from the expertise and facilities available at Bolton both in the materials departments and beyond.

The spacer fabrics were tested over 20,000 cycles, showing they lose considerably less thickness than alternative foam products, an important selling point for Airospring. This took advantage of Bolton's advanced

News from the KTN

Dr Iain McGregor joins KTN



Iain McGregor,
Director of KTN



Iain McGregor CEng FIMechE has recently joined the Knowledge Transfer Network as a Director. His team covers the areas of advanced materials, chemistry, manufacturing, sustainability, resource management and the KCMC.

Prior to joining KTN, Iain was Manager, Technology at Tata Steel where he managed a team of 20 engineers assisting customers to use the latest steel products in automotive, yellow goods and other industrial sectors. His work in the automotive, aerospace, rail and material industries has focused on reducing mass in structures through the use of advanced materials and computer simulation. He has worked for Lotus Engineering, ABB Transportation and Alcan International. He studied at Glasgow University and has a BSc in aeronautical engineering and a PhD in composite materials, which he completed with Westland Helicopters and ICI.

His aspiration for the Knowledge Transfer Network is to accelerate the delivery of great innovation through collaboration across industrial sectors. The KCMC is committed to deliver this aspiration by accelerating the introduction of innovations into the market through the application of world class materials chemistry.

Horizon 2020 update



The second Horizon 2020 work programme has been announced and contains a few important changes of interest to those already involved, as well as a number of funding calls - new and renewed - which will be of interest to the materials chemistry world.

The work programmes fall into similar groupings as before, with the most relevant for materials researchers being the Nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology (NMPB).

It also sees the addition of the Cross-cutting work programme, which has a strong focus on the circular economy. SPIRE (Sustainable Process Industries)

and Factories for the Future (FoF) move into this section.

NMBP also sees a move to two stage proposals, which have proven popular. This allows applicants to submit a summary proposal initially and only move to a full proposal once they have been confirmed as a serious contender for funding.

Calls to look forward to which may be of interest to KCMC members include:

NMBP: Opening 11th May 2016

- NMBP-06-2017: Improved material durability in buildings and infrastructures, including offshore

- NMBP-07-2017: Systems of materials characterisation for model, product and process optimisation

- NMBP-19-2017: Cost-effective materials for "power-to-chemical" technologies

Full list at: <http://bit.ly/1ZD311r>

Cross-cutting: Opens 20th Sept 2016

- SPIRE-10-2017: New electrochemical solutions for

industrial processing, which contribute to a reduction of carbon dioxide emissions

Full list at: <http://bit.ly/1Ssc1s4>

The SME Instrument (<http://bit.ly/1P1lcdi>) is also open to potentially disruptive SMEs, with broad funding opportunities in areas such as nano- and biotechnology. Deadline for entries recur every three months. The Eurostars programme offers R&D-performing SMEs funding for international collaborations, with the next deadline in February 2016 and every six months thereafter (<http://bit.ly/1HTs9BY>).

Interested parties should also look at the Strategic Innovation and Research Agenda from Suschem UK of which the KTN (host of KCMC) is the secretariat. This sets the context and priorities for sustainable chemistry research and innovation and feeds into the EC's programme setting: <http://www.suschem.org/publications.aspx>

Upcoming events

The KCMC event "Materials for the Future: From Chemistry to Application" will be held on 11 February 2016 at Church House, Westminster, London.

The event will start at 12:30 with lunch. The opening presentation will be by Ruth McKernan, Chief Executive of Innovate UK followed by themed presentations from leading experts in the use of new advanced materials in energy, transport, health and the importance of computational modelling in materials design for the future.

An exhibition area to showcase and exchange ideas in the development and application of new advanced materials innovation.

The event will provide opportunities to:

- Network with delegates to help seed new opportunities and set the context for future development
- Access to expertise and resources to help accelerate business growth in line with industry sector strategies
- Connect with Innovate UK and the KTN to help support your business growth

To register for the event via Eventbrite please use this link <http://bit.ly/1LBwepo>

Technology-inspired innovation

Innovate UK is investing £2 million in technical feasibility studies to stimulate innovation across: advanced materials; biosciences; electronics, sensors and photonics; and ICT.

Projects must be led by a small or micro company. They should focus on early-stage technical opportunities, last up to four months and not exceed £33,000.

Areas of interest to KCMC may include: materials modelling, energy generation, circular economy, synthetic biology, bio-based and sustainable solutions, and naturally inspired materials.

The competition opens on 18 January 2016 and deadline for applications is at noon on 16 March 2016.

There will be a briefing days in Edinburgh on 12th January 2016 and London on 26 January 2016. A webinar will also be available. Sign up via this link: <http://bit.ly/1NahwH0>.

Surface Engineering and Advanced Coating Technology

Innovate UK have announced a £2m technical feasibility study competition in surface engineering and advanced coatings (SEAC).

The competition will be open to businesses and research organisations, as a single company or a consortium. Projects should cover one or more of: process design excellence, sustainability, new applications for existing SEAC technology, enhanced coatings for improved performance, and enhanced surface treatments for improved performance. Costs should be £50K-150K per project.

This single-stage competition opens on 11th January 2016. The deadline for registration is noon on 9th March and for applications, noon on 16th March.

Briefings on the competition and application process will take place in January in London (19th), Glasgow (11th), Belfast (14th) and Cardiff (20th).

To register for the event, please e-mail David.Wimpenny@the-mtc.org with: name, organisation and contact details.



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The Heath
Runcorn
WA7 4QX

T: 01928 511 824
maureen.laughton@ktn-uk.org
www.materialschemistry.org.uk