



KNOWLEDGE CENTRE
**MATERIALS
CHEMISTRY**

Annual Report 2016



The Team

John Conti-Ramsden
Director

Steve McBride
Knowledge Transfer Manager



Mike Holmes
Knowledge Transfer Manager



Colin Cooper
Knowledge Transfer Manager

Maureen Laughton
Operations Manager

Contents

- 2 The team
- 4 KCMC mission
- 5 The Importance of Materials to the Future of the UK Economy
- 6 Executive Summary
- 7 KCMC at a glance
- 8 KCMC In The Innovation Landscape: An Independent View
- 9 UK Research and Innovation
- 10 KCMC Metrics
- 12 University of Bolton and TBA Protective Technologies smart fire protection
- 13 The Hartree Centre: supporting the UK Biofilms Programme
- 13 Advanced materials for medical applications
- 14 University of Liverpool leads in accelerated materials discovery
- 16 ADDoPT
- 16 Manchester Engineering Campus Development
- 17 The Henry Royce Institute
- 17 From support for SMEs to relationships with multinationals
- 18 Materials Chemistry SIG
- 19 Connect Facilitate Deliver

KCMC Mission

The KCMC's mission is to accelerate product and process innovation through collaborative research and development in materials chemistry. I would like to highlight two important words in that statement – innovation and collaborative – because new collaborations are a catalyst for fresh ideas and can result in a step-change in innovation. As part of the KTN, the KCMC is able to access and benefit from our expertise in connecting sectors, disciplines and skills to produce the best collaborations and business approaches.

An independent review of the KCMC has concluded that it fills an important niche in the UK innovation landscape, providing wide-ranging benefits to both industry and research institution partners. The report also found that the KCMC has facilitated engagement in higher-risk activities, which is so often the key to true innovation.

In my foreword to last year's Annual Report, I mentioned that the KTN was conducting a business survey of our members. I am delighted to report that 1 in 5 of the more than 2,000 respondents indicated that the KTN had helped them source investment; generating an investment multiplier of £12.50 of new investment per £1 of grant obtained. Over 30% of survey respondents said we had provided valuable introductions to others; while 70% benefitted from attending a KTN event.

KCMC activities will have made a valuable contribution to these results by enabling collaborations between the materials chemistry research base and industry, and delivering new products and processes to the marketplace, with real benefits for the UK economy.

Moving forward into 2017, the KCMC will be well positioned to contribute to the UK Government's Industrial Strategy, which aims to increase productivity and drive growth across the whole country with significant investment in science, research and innovation.

**Chris Warkup Chief Executive,
Knowledge Transfer Network (KTN)**



The Importance of Materials to the Future of the UK Economy

- The recent crisis in the UK steel industry has highlighted to the Government and the wider population the criticality of materials supply to the strength of the economy. The leading role of the UK in turning materials invention into global economic success has been highlighted in successive waves of transformative industrial innovation: the invention of pig iron by Abraham Darby in the early 18th century, which helped catalyse the industrial revolution; the invention of the now ubiquitous polyethylene by ICI in the early 20th century; and, in the mid-20th century, the invention of the float glass process by Sir Alastair Pilkington. Given recent changes in the political landscape, we are once again at a crossroads where the creation and application of new materials will have an important part to play in sustaining a successful post-Brexit UK economy.

Supply chains are key to the successful commercial exploitation of any technology innovation. They play an essential part in building strong and resilient industries, creating employment and – importantly – developing and maintaining essential skills in the workforce.

Of critical concern for manufacturing in the UK is the hollowing out of key supply chains that has taken place over the past four decades. Building such supply chains requires us to re-build not just the 'hardware' (ie the facilities and machinery), but also the expertise and knowledge to exploit that hardware. In the case of a disruptive technology, the expertise and knowledge is created during early-stage research and is matured as the technology moves into the supply base, where companies and people equip themselves to scale up and turn the innovation into real economic value-add. The opportunity

to anchor the greatest value within the UK supply base is to embed new and innovative materials at the earliest stage in the product development cycle.

In the automotive, aerospace and, increasingly, rail sectors, the need to meet ever-tightening emissions targets is driving the emergence of a range of disruptive innovations such as affordable composite materials for light-weighting, and advanced battery technology for energy storage and electrification of vehicles. In each instance (and there are many others), the growth opportunities for the UK economy are real and immediate.

By illustration, the UK demand for lightweight composite components is projected to rise from the current level of £2bn/y to £12bn/y by 2030. However, based on current supply chain dynamics, approximately 60% of the value is likely to be lost to offshore raw materials suppliers. The market opportunity to displace those imports through the creation of a competitive UK supply chain is clear. In a second illustration, the burgeoning success of the UK automotive industry (a record high of £69.5bn turnover in 2016) is based on a current supply chain dynamic whereby approximately 60% by value of parts are imported (mainly from the rest of Europe). The move towards electric vehicles will inevitably disrupt existing supply chains and will provide a great opportunity to establish UK-based industrial providers.

A common thread that runs through these illustrations is the vital role that materials science will play in dictating a positive outcome for the UK economy.

The challenge, as a nation, is to follow that thread by harnessing and coordinating our resources (world-class universities, the KTN, the HVM Catapult, industrial councils (the Auto Council, the Chemistry Growth Partnership et al), the financial sector and government stakeholders) to create and secure major UK-based supply chains that will support emerging market needs. The KCMC has a clear role to play as a facilitator within this mission.

'Materials matter.'

Dick Elsy, CEO and Professor Mike Hinton, Director of Research and Technology Partnerships, High Value Manufacturing Catapult



KCMC

Executive Summary

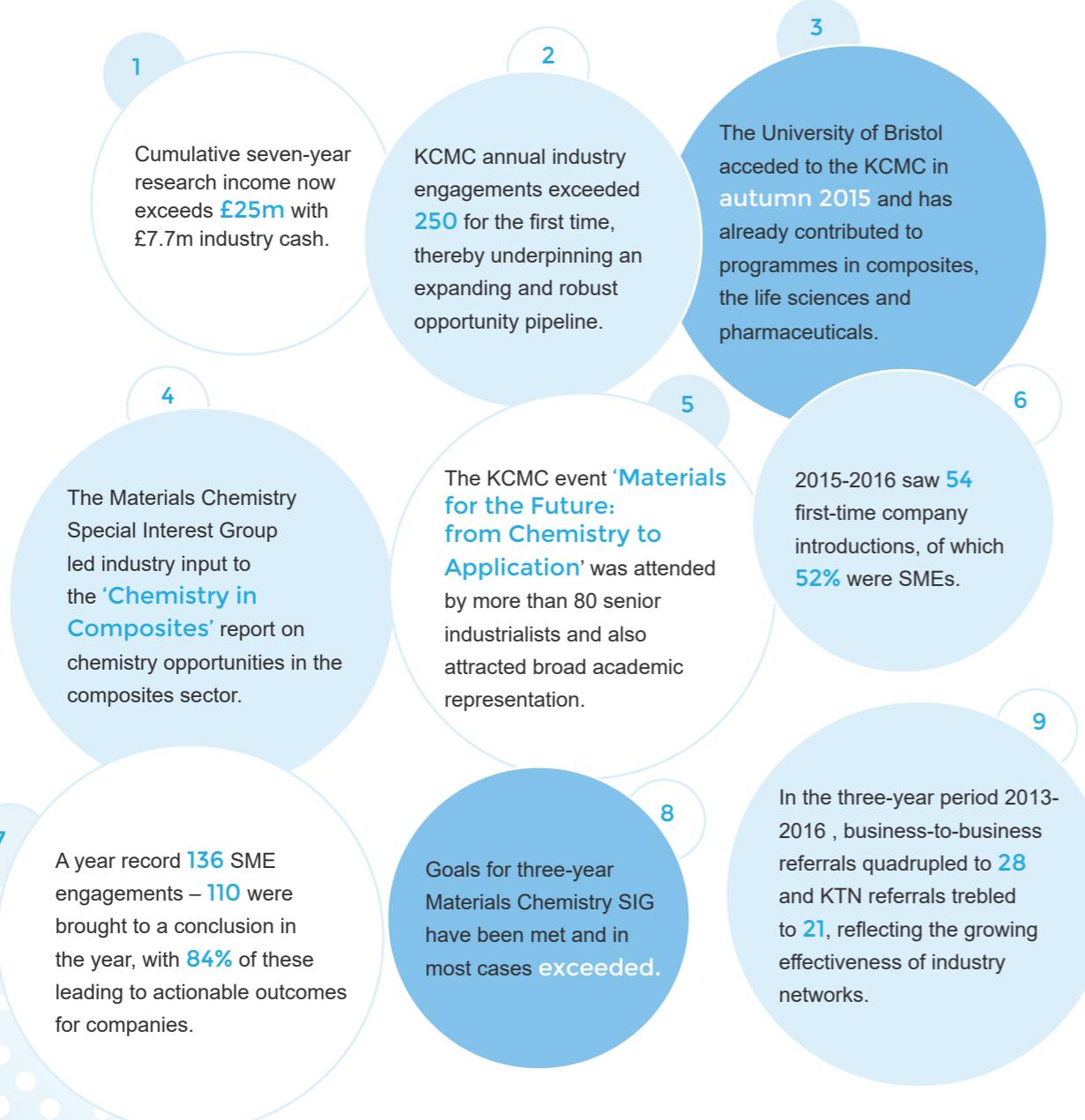
- Materials chemistry is a vital enabler of the new advanced materials required for sustainable solutions for society and industry, especially in energy, health and transport.

The KCMC uniquely connects and networks academia and industry, facilitating collaborative R&D that can help companies deliver accelerated innovation-to-market timescales.

Key highlights of KCMC achievements in the year to 31 March 2016 include:



John Conti-Ramsden



KCMC at a glance...

- The KCMC's mission is to accelerate product and process innovation through collaborative R&D in materials chemistry

Important attributes for business

- A seamless, responsive industry relationship/network.
- Well-managed access to unique expertise, equipment and testing facilities – a single point of contact to leading research institutions.
- 'Best fit' to company requirements and a fast-track option for projects via dedicated scientists in partner institutions.
- Partnering non-competing industries.
- High-quality structured networking.
- Excellent connections and networks.
- Awareness of funding opportunities and access to national networks, grants and support for collaborative R&D.
- Quick and responsive support.

The KCMC is a virtual centre hosted by the UK Knowledge Transfer Network (KTN). The Centre provides highly flexible access to multi-disciplinary academic research and expertise through its partners, which currently include the universities at Manchester, Liverpool, Bolton and Bristol as well as the Science and Technology Facilities Council (STFC) at Daresbury.

Economic benefits

- Direct impacts on key business performance metrics, e.g. sales, markets, costs and turnover; and indirect impact through this to the wider economy and supply chain, thereby leading to GVA benefits.
- Direct impact on R&D expenditure by encouraging R&D that would have been unlikely otherwise (too expensive, risky or not thought to be possible).
- Leveraging further R&D support as work has been proven to be a result of KCMC input.
- Offering a cost-effective approach to exploitation of research and science, with both industry partners and the knowledge base capitalising on their own assets for scaling-up and exploitation of new concepts rather than investing direct KCMC resources in large-scale prototyping and pilot-scale facilities that can also be offered by others in the economy, e.g. the Catapults.
- Securing additional research income and leveraging research funding for the knowledge base.
- Reduced time and transaction cost to get to successful R&D collaboration.
- Commercial/economic impacts are typically delivered to be 2-5 years away from businesses' first engagement.

KCMC In The Innovation Landscape: An Independent View



"The KCMC's expanding Materials Chemistry capabilities lie at the heart of the UK's ability to develop new functional materials for industry. The key to accelerated innovation in Materials Chemistry is ensuring the right industrial strategies and collaborative frameworks – with design, engineering, industrialisation and end-users – are not only in place but aligned to deliver and I think with our partners we've made significant progress this year."

John Grasmeder Chair,
KCMC Industry Steering Group
and Technical Director,
Victrex Polymer Solutions



KCMC Leadership Team

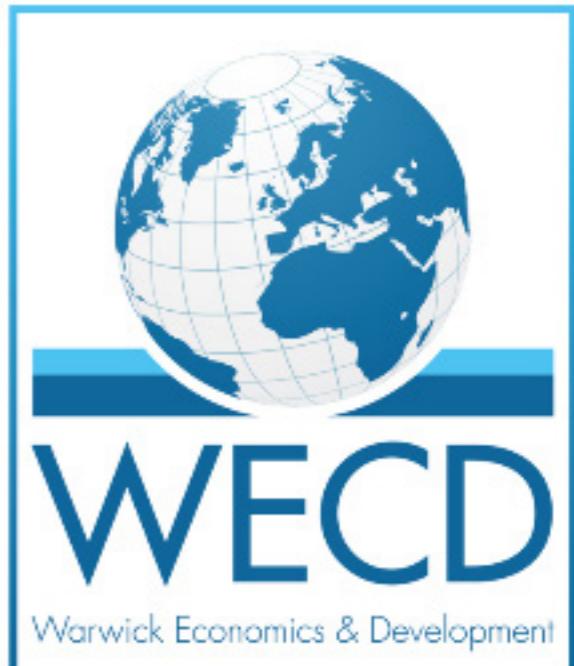
Prof. Baljinder Kandola, University of Bolton
Dr. John Conti-Ramsden, KCMC Director
Prof. Matt Rosseinsky, University of Liverpool
Prof. Mike Turner, University of Manchester
Prof. Duncan Wass, University of Bristol
Dr Paul Sherwood, STFC

During 2015-2016, an Independent Evaluation was carried out on the KCMC by respected Warwick Economics & Development (WECD). The evaluation shows that the KCMC adds significant economic, translational and commercial value to the UK innovation ecosystem. Key six-year cumulative metrics at the end of the financial year in March 2015 were as follows:

- **KCMC income: £19.4m.**
- **472 companies engaged (39% were SMEs).**
- **£234m GVA benefit for the UK economy.**

The KCMC's performance is highly rated by businesses, academic/research partners and external stakeholders and, in the seven years since its establishment, it has expanded, become well connected and raised its reach, impact and profile beyond its original sectoral and geographical focus – and this expansion has impacted positively upon the quality of its offer. Key recommendations to further develop the contribution of the KCMC in the innovation landscape are:

- To build breadth and depth of capability by further expansion of the KCMC to deliver its vision for accelerated new materials innovation across the UK.
- To explore further the need for industry-responsive resources and new funding models.
- To seek to develop more strategic relationships as part of the KCMC's partnership with the Catapults.
- To develop connections with local and sub-regional economic development agents in key priority areas.



UK Research and Innovation

The formation of UK Research and Innovation¹, with its dual remit to push the frontiers of human knowledge through blue skies research and deliver impact for UK society, public services and the economy through world-class research and business-led innovation is a landmark development in the UK innovation landscape.

The KCMC looks forward to working with leading players across the innovation landscape to help deliver on this vision in the field of materials chemistry.

¹ UK Research and Innovation announcement: See <https://www.gov.uk/government/news/john-kingman-to-lead-creation-of-new-6-billion-research-and-innovation-body>

CONNECT

- The KCMC progressed 320 industry engagements in 2015-16, a 30% increase on the prior year, partially reflecting the impact of the University of Bristol's accession to the Knowledge Centre. The balance across industry sectors maintains an even split between companies focussed on chemicals and materials, and companies specialised in downstream industries. Significantly, in 2015-2016, the sector balance for SME engagements was different than for larger companies, having a substantially higher proportion of chemicals & materials companies over downstream ones, (Figures 2, 3 and 4). This highlights the role of the KCMC in connecting up materials chemistry innovators with the challenges facing manufacturing industry.

The KCMC's focus on cross-sector working and opening up new connections has been powerfully supported by its host organisation, the Knowledge Transfer Network, and has helped catalyse new collaborations in sectors as diverse as energy, construction, life sciences and transport. The power of this

Figure 1 Industry Engagement by Company Type

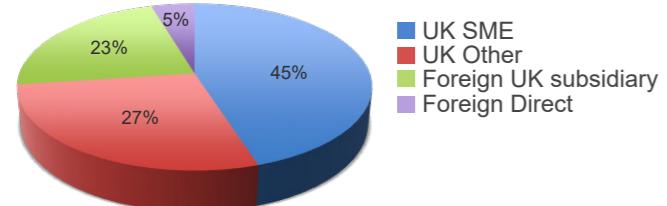


Figure 2 Industry Engagement by Sector

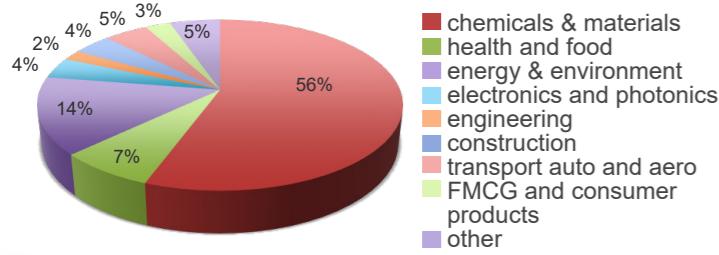
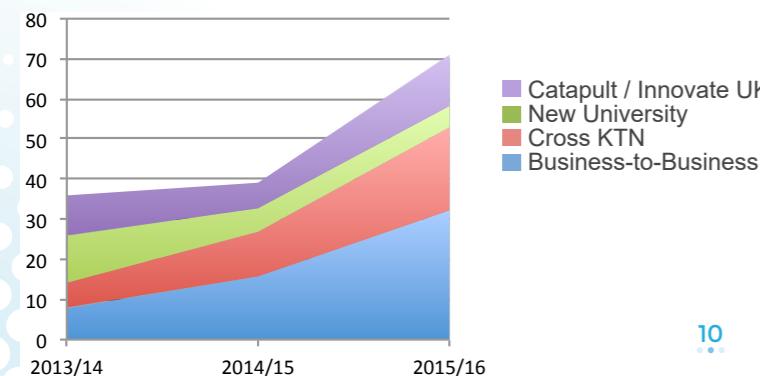


Figure 5 Referrals Per Year 2013-2016



joined-up approach was evidenced by the event 'Materials for the Future: from Chemistry to Application' held in January 2016, which brought together senior academics and representatives from more than 80 companies with leaders from across the innovation landscape, including attendees from Innovate UK and the KTN, the High Value Manufacturing Catapult, the Chemistry Growth Partnership and the Advanced Materials Leadership Council.

The industry engagement pipeline has clearly benefitted from the consolidation of multiple-sector knowledge transfer organisations into the KTN. Figure 5 shows the rapid expansion of cross-KTN and business-to-business referrals in the three-year period of Innovate UK funding of the Materials Chemistry Special Interest Group (2013-2016). Strikingly, cross-KTN referrals were nearly all into downstream sector groups, including space, defence, life sciences, energy/nuclear power, construction, food etc. – and more than 80% were for SMEs.

Figure 3 Industry Engagement by Sector (SME)

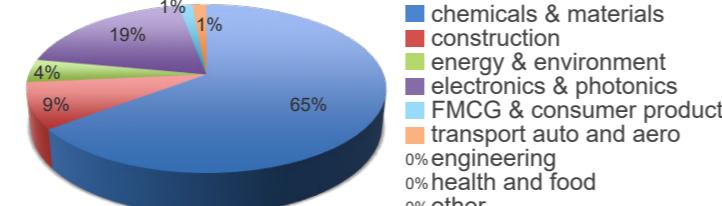
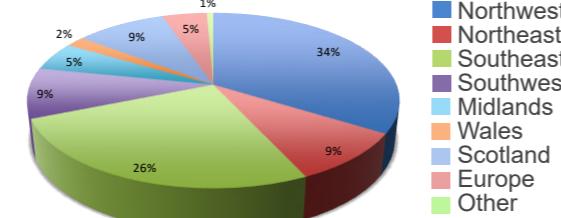


Figure 4 All companies: Region



KCMC Independent Evaluation Data –

National Impact

The KCMC Governing Board commissioned an independent evaluation at the completion of this funding period to evaluate the impact and effectiveness of the KCMC and help plan for future development. This evaluation highlighted the important role of the Centre as a knowledge broker in new materials

FACILITATE AND DELIVER

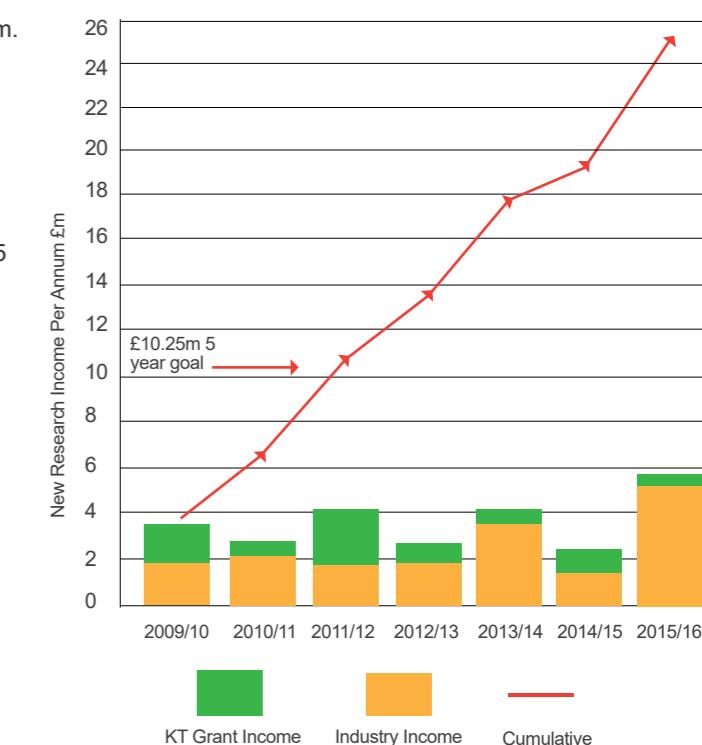
Cumulative seven-year research income now stands at £25.1m. Rolling five-year research income is £18.5m, up on 2014-15 (£15.6m).

The project pipeline has been stable over the past three years, with conversions of industry engagements to project discussions roughly constant in each year since 2013 at ca. 45 per annum.

Major project highlights include ADDoPT (Advanced Manufacturing Supply Chain Initiative funded at the STFC on digital design of pharmaceutical therapeutics), EPSRC funded programmes on Manufacturing with Light (application of photocure to Atomic Layer Deposition) and Routes to Liquid Fuels from Carbon Dioxide (both at University of Liverpool), Smart Protection Products (KTP at Bolton University) and Materials for Next Generation OLED's (European Research Council grant at University of Manchester).

research across the innovation landscape. In addition to industry and universities, this draws in Innovate UK, the KTN, the Catapult centres and regional innovation groups. The breadth of KCMC interactions and its increasingly national role is highlighted by the regional spread of SME interactions in the evaluation period (Figure 1). The overall GVA impact of KCMC activities was estimated at £234m.

KCMC Collaborative Research Income 2009-2016



KCMC expansion – two new research partners

Achieved 2 new partners: the University of Bristol acceded to the KCMC in 2015; although Cardiff University participated for one year, this was not maintained. Another research institution has indicated interest in joining the partnership and will accede to the KCMC in the next financial year.

Case studies to demonstrate economic impact – a minimum of 15 new case studies

17 case studies in a combination of reports and events including Victrex, Pilkington NSG, Cambridge Display Technology, William Blythe, Datalase, Sun Chemical, ACAL Energy, Ceres Power, Baltex, Croda, Nanoco, Infineum and Cellucomp

Relationship development with the High Value Manufacturing Catapult (HVMC)

The KCMC has contributed to multiple meetings with HVMC centres and events bringing in catapult representatives including Centre for Process Innovation National Composites Centre, Warwick Manufacturing Group, Offshore Renewable Energy; Regenerative Medicine; joint project proposals and referrals are being initiated.

Case Study:

• University of Bolton and TBA Protective Technologies smart fire protection

The idea

Fire protection with integrated wireless sensor technology will allow for better management of fires, thereby saving lives and protecting physical assets. The Knowledge Transfer Partnership scheme has provided funding to TBA Protective Technologies and the University of Bolton to develop smart fire protection products.

The challenge

The main aim of the project is to integrate and connect wireless sensors with established textile-based fire protection products.

The approach

By transferring expertise in flexible sensors, energy harvesting and Bluetooth connectivity to TBA Protective Technologies, a leading specialist in fire protection, a smart system will be developed capable of measuring and reporting temperature and other environmental conditions to a control unit.

The benefits

Smart fire protection, when deployed in marine and multiple occupancy buildings (for example), can inform emergency services as to the progress and development of a fire and how best to fight it, enabling them to prioritise resources in order to save lives and assets.

The timeline

The initial KTP is for two years and commenced in September 2016.



The Hartree Centre: supporting the UK Biofilms Programme

- Innovate UK and the Biotechnology and Biological Sciences Research Council (BBSRC) have announced the availability of up to £12.5m in funding to establish a Biofilms Innovation Knowledge Centre. As part of the initiative, the Hartree Centre is offering up to £1m worth of access, mainly in the form of computer time, to its high-performance computing (HPC) facilities.

Biofilms create challenges across multiple areas of research and industry. They can form on any surface that comes into contact with bacteria and water, the most common examples being found in areas such as medical implants and plaque. They are highly versatile and can be found in industries spanning health care, manufacturing, consumer products, nuclear power and the agri-food sector.

The five-year Innovate UK / BBSRC programme aims to encourage cross-sectoral approaches to enable UK research organisations and industry to address some of the challenges and opportunities of biofilm science and technology. It will be based on four strategic themes: prevention, detection, management and engineering. It will build upon recent advances in research on biofilms with the partnership between Innovate UK and BBSRC enabling industry to take advantage of biofilm capability for economic, scientific and societal reward.

For more details and FAQs visit:

<http://www.bbsrc.ac.uk/innovation/collaboration/collaborative-programmes/biofilms-programme/>

Advanced materials for medical applications

The key global challenges to be addressed through new breakthrough innovations within materials chemistry include antibiotic resistance and more efficacious drug formulations.

The Chemistry Department in Bristol University is a key player in the BristolBridge programme, which is funded by the EPSRC to tackle antimicrobial resistance (AMR).

Within the University, the KCMC has been instrumental in creating a collaboration between the anti-infectives division of Redx Pharma and the department to investigate the feasibility of using a newly developed carbon dot material as a modification and delivery vehicle to investigate the re-purposing of a class of antibiotics with known activity in Gram-positive bacteria into active agents for Gram-negative AMR bacteria.

For efficacious and new formulations and crystal forms in pharmaceutical applications, Bristol Chemistry has developed a novel technique using the application of external magnetic fields to control and drive the production of new undiscovered and highly stable crystal polymorphs that could potentially provide routes to higher biological activity at lower concentrations and/or more stable formulations. The academic lead, Dr. Simon Hall, has recently won a Horizon 2020 grant to develop this methodology further and, through the KCMC, has in-kind support from a key major pharmaceutical company.

University of Liverpool leads in accelerated materials discovery

The world contains millions of materials, all with their specific properties, structures and ratios of the elements. But while nature has furnished us with this palate of substances, it is the role of materials chemists to exploit the Periodic Table to produce new materials with the properties that we need for the development of future technologies. At the University of Liverpool's Department of Chemistry, Professor Matthew Rosseinsky is leading an EPSRC-funded research programme to combine experimental chemistry with computational techniques to not only create new functional materials but also to predict their structures and properties.

Rosseinsky explains: "I started out life as a purely experimental scientist, so I would perform experiments to make new materials and study them and find out what their structures and properties were. More recently we've used computational calculations and computational modelling, initially to understand some of our experiments, but now increasingly to predict what the experiments might give us."

Rosseinsky, an inorganic chemist, and KCMC principle Investigator, and Organic Chemist Andy Cooper lead the work at the University of Liverpool and seek to further develop capabilities that combine computation and experiment to design new materials with tailored properties:

Materials Innovation Factory (MIF)
supplied by University of Liverpool



Professor Matthew Rosseinsky,
University of Liverpool.

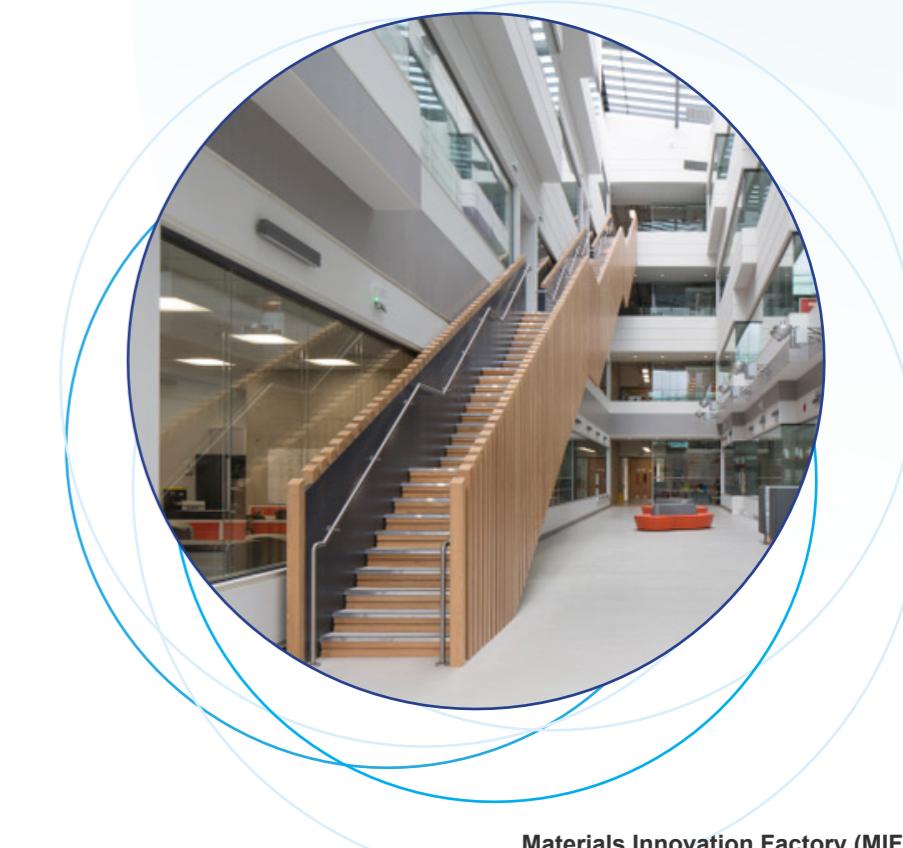
"Quite a lot of what we do is to use experiment to guide the development of new forms of computational work; so we're not merely taking existing protocols and applying them to our work, we are actually developing new protocols as well," Rosseinsky explains. This is an exciting prospect for partners in the University of Liverpool's Materials Innovation Factory, which depends on developments such as these to drive its ambition in Computer Aided Materials science.

Rosseinsky describes his work as being akin to engineering:

"The way that we see it is to think that if you wanted to build a bridge, you could do that today because we have Newton's laws, but they don't work for atoms, you have to use quantum mechanics. This requires computation to help establish the most stable, accessible configurations of the atoms the team is dealing with. Chemical reactivity and functionality then arises from the spatial arrangement of the functional groups and structures in these substances, and can be confirmed by experimentation. The materials synthesised tend to be extended networks rather than individual molecules."



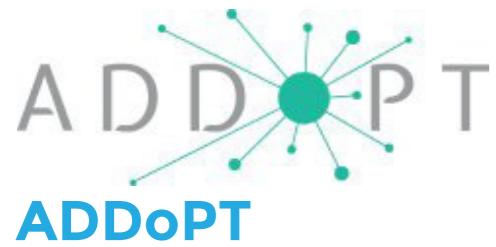
The research programme is divided into four themes, the first focuses on new arrangements of matter to find new materials and study their properties. The other three themes are targeted at more specific properties and applications, including energy harvesting and materials such as thermoelectrics, which convert heat into electricity; ion transport, such as solid materials that can conduct lithium ions in batteries without the need for flammable organic liquids; and multi-functional materials, such as those that exhibit both ferromagnetic and ferroelectric properties, on which Rosseinsky comments: "It turns out that this is a hard thing to achieve from a scientific viewpoint, but it's interesting as a route to information storage that uses less energy than silicon-based transistor RAM."



Materials Innovation Factory (MIF)
supplied by University of Liverpool

Work at the University of Liverpool has already produced polymer photocatalysts that are amongst the most active materials yet found for generating hydrogen from water using solar power. Rosseinsky emphasises that the main goal is to develop the capability to combine computation and experiment to generate new materials, and to train scientists in these techniques:

"You have to build a team where everyone understands what the end goal is, and thereby accelerate the process of materials discovery. At the moment, people often see themselves as purely computational or purely experimental. In the future, to make best use of all the techniques and capabilities we have, people are going to need to work seamlessly across those divides."



Manchester Engineering Campus Development

Construction has begun on Manchester Engineering Campus Development (MECD), the £350m home for engineering at The University of Manchester. This flagship project will bring together a multi-disciplinary engineering and scientific community and consolidate the University's student campus around Oxford Road.

Due for completion in late 2020, it is one of the largest single-construction projects ever undertaken by a higher education institution in the UK. It brings under one roof the University's four engineering schools and two of its research institutes, boasting flexible research labs, bespoke project areas and interactive learning environments to support innovation, creativity and collaboration on a completely new scale.

The ADDoPT project consortium consists of twelve partners:

- **Leading businesses in the pharmaceutical value supply chain** – Pfizer Ltd, GlaxoSmithKline plc, AstraZeneca Ltd UK and Bristol-Myers Squibb Pharmaceuticals Ltd
- **Knowledge-driven small to medium-sized enterprises (SMEs)** – Process Systems Enterprise Ltd (PSE), Perceptive Engineering Ltd, and Britest Ltd; and
- **Specialist knowledge-based partners from UK universities and research centres** – Cambridge Crystallographic Data Centre (CCDC), the University of Leeds, the University of Cambridge, the STFC Hartree Centre, and the University of Strathclyde.

The project is being co-ordinated by PSE.

The Hartree Centre is leading a work package to deliver an ontology and model for clinical and commercial manufacturing data establishing agreed parameters for investigation, data formats and analytical methods (using a Cross-Industry Standard Process for Data Mining) in order to produce a final service analytics system. The Centre is also a contributor to a second work package focussed on building a mechanistic model-based infrastructure and the development of models for existing and emerging unit operations. By combining insight from fundamental and industrial research, the Centre can provide the link between raw materials, manufacturing processes and the needs of the patient.



The architect's view of the Manchester Engineering Campus Development



The Henry Royce Institute

- The Henry Royce Institute has appointed a leading materials scientist and engineer as its Chief Executive. Dr. Andrew Hosty joins the Institute having previously worked for Morgan Advanced Materials plc, where he was Chief Operating Officer.

A Fellow of the Royal Academy of Engineering and The Institute of Materials, Minerals and Mining, Dr Hosty has more than 25 years' experience of the commercial sector with main board experience of FTSE 250, and private businesses and has worked at all stages of business growth and economic cycles.



The University of Manchester

From support for SMEs to relationships with multinationals

The University of Manchester is developing broad partnerships with major international companies that recognise its interdisciplinary expertise available to support their long-term goals and solve significant business challenges. During the past year these included representatives of sectors from industrial biotechnology, oil & gas, biomedical equipment, energy distribution, chemicals, IoT, electronics and advanced manufacturing.

At the opposite scale, the University has a dedicated SME support team, including co-funding mechanisms for projects, allowing SMEs to access its expertise and facilities easily and efficiently. The University works in partnership with Manchester Growth Company, which offers business support for local SMEs in areas outside the scope of the University and is able to signpost them to University capabilities. To contact The University of Manchester about possible collaborations email collaborate@manchester.ac.uk



The architect's view of The Henry Royce Institute supplied by University of Manchester

Materials Chemistry SIG

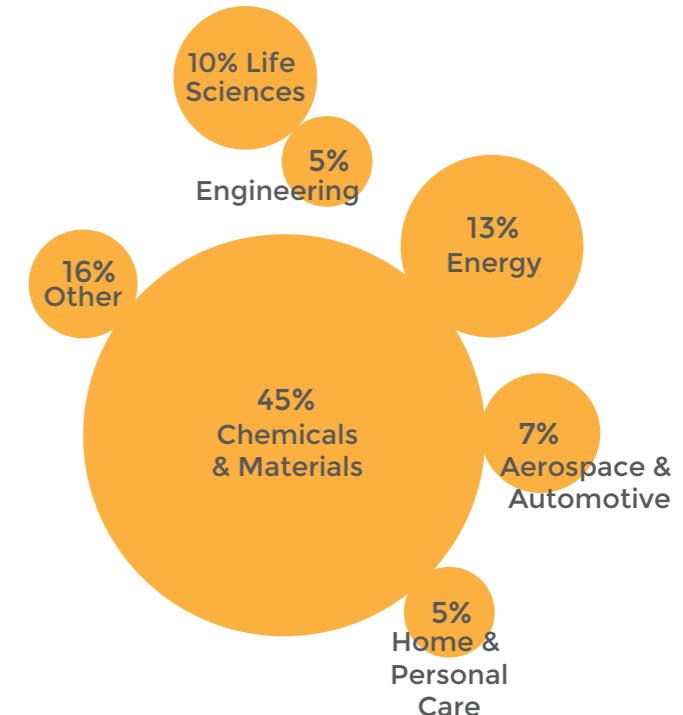
A major activity for the Materials Chemistry SIG in 2015-2016 was the review of opportunities for chemistry to contribute to the success and growth of the UK manufacturing industry in long-fibre reinforced composites. The KCMC hosted two industry meetings with a breadth of representation from chemistry-using companies to identify the key enablers in science, technology and business, leading up to the publication of the report 'Chemistry in Composites' published at the end of 2015 in collaboration with Composites UK. The report highlighted the opportunities for computational modelling in materials design, advanced characterisation and analysis to link with new design tools, and the importance of new chemistries and process technologies to delivering the cost, functionality and sustainability required for the many new applications emerging for composite materials in next-generation manufactured products.

Composites were a major feature at the New Materials for the Future: from Chemistry to Application event, organised in London with the help of the KTN and Innovate UK, featuring speakers from industry, the HVM Catapult and Innovate UK.



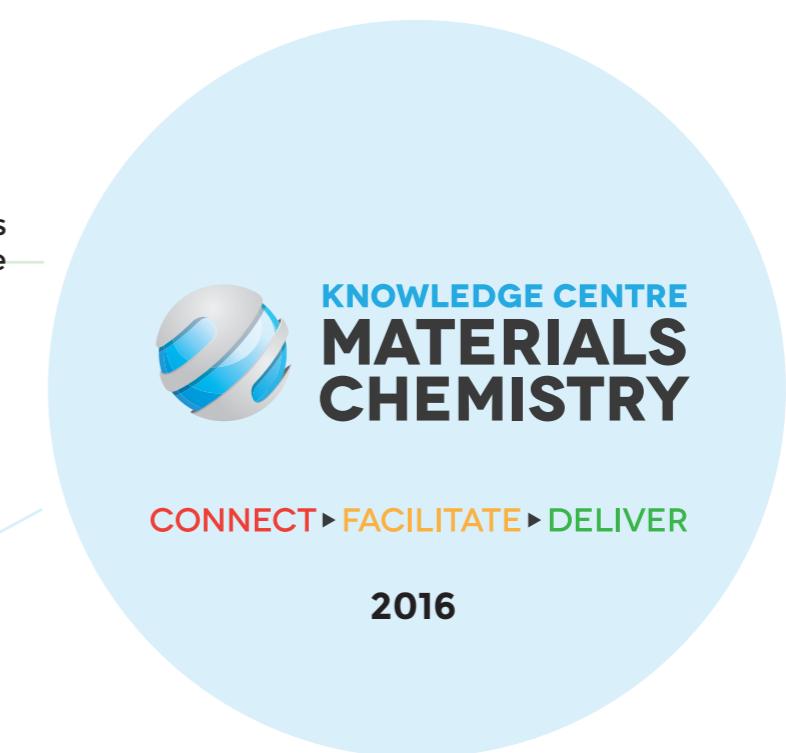
KCMC Industry Steering Group 2016

Finally, a joint industry-KCMC meeting was held with senior representatives from the Advanced Materials Leadership Council, seeking to identify how materials chemistry companies can help deliver industry solutions against the major challenges identified by the AMLC in materials design and development for applications including health, communications and electronics, energy and materials for demanding environments. Recommendations were made for technology demonstrators and, following the meeting, consultation documents on key areas for new materials innovation ranging from approaches to 'bottom-up' materials design to emerging applications enabled by new materials functionality were produced.



CONNECT

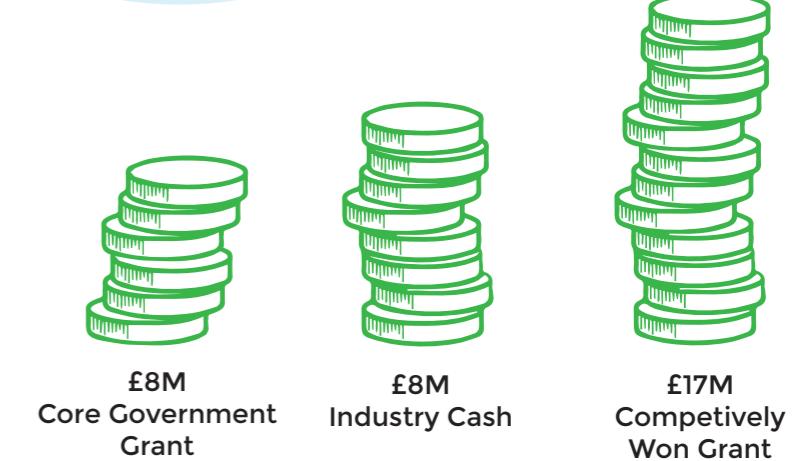
KCMC has made 582 first time connections across UK and Europe



DELIVER

Leveraged £25M Collaborative Research Income from £8M Core Grant

Delivery > £250M GVA





KNOWLEDGE CENTRE
MATERIALS
CHEMISTRY

• • •

info@materialschemistry.org

Innovate UK
Knowledge Transfer Network