COUNCIL FOR SCIENCE AND TECHNOLOGY

Science Landscape Seminar Series: Representative UK Advanced Materials Infrastructure

Notes to reader

This document is to inform discussion only and is subject to the following caveats:

- Inclusion, non-inclusion or otherwise is not intended to reflect on the standing of any organisation or infrastructure.
- We did not include classified defence and intelligence assets.
- “Advanced Materials” is defined as materials whose structure and functionality has been modified to satisfy demanding requirements of specific applications. It also includes the innovative use of basic materials to significantly improve performance of a product or technology.
- Assignment of Research Areas, Eight Great Technologies and Industrial Strategy sectors was based on desk research and may be subject to error. Categories are designed to inform the general discussion and not reflect on individual organisations or infrastructure. Absence of icons in category tables indicates that (in the project team’s opinion) a piece of infrastructure cannot be easily categorised.
- If any mistakes have been made, please inform the seminar secretariat on cstinfo@go-science.gsi.gov.uk.

Logo Key

Location

 UK

 EU

 Global

Funding

 Research Councils

 Departmental

 Private Sector

 Charity

 Academic

 European

Research Area

 Arts and humanities

 Biological and medical sciences

 Earth sciences

 Engineering

 Physical, mathematical and computer sciences

 Social and economic sciences

Eight Great Technologies

 Energy Storage

 Big Data

 Satellites

 Robotics and Autonomous Systems

 Synthetic Biology

 Regenerative Medicine

 Agri-Science

 Advanced Materials

 Quantum Technologies

Industrial Strategy

 Life Science

 Aerospace

 Professional Business Services

 Education

 Nuclear

 Oil and Gas

 Automotive

 Offshore Wind

 Information Economy

 Construction

 Agri-tech

List of infrastructure

The infrastructure identified has been categorised in to the lists below. There will be instances when items could fit in to multiple lists and in these cases we have tried to place the infrastructure in the most appropriate list.

Collaborative research centres and institutes

Centres and institutions that represent collaboration between more than one organisation (frequently industry and academia)

BP-International Centre for Advanced Materials (University of Manchester)
Cambridge Graphene Centre (University of Cambridge)
Centre for Materials Discovery (University of Liverpool)
Dalton Nuclear Institute (University of Manchester)
EPSRC Centres for Innovative Manufacturing
Graphene Engineering Innovation Centre (University of Manchester)
London Centre for Nanotechnology (Imperial College/ UCL)
Materials Innovation Factory (University of Liverpool)
Maxwell Centre (University of Cambridge)
National Graphene Institute (University of Manchester)
Polymer Centre (University of Sheffield)
SPECIFIC (Swansea University)
Stephenson Institute for Renewable Energy (University of Liverpool)

Academia (with critical mass in materials research areas)

In addition to the collaborative centres outlined above, many academic institutions have thriving materials groups, undertaking independent research. As such a brief guide to those top 12 institutions deemed by EPSRC (and citation data) to have a critical mass in advanced materials research areas is provided.

Imperial College
University of Birmingham
University of Bristol
University of Cambridge
University College London
University of Leeds
University of Liverpool
University of Manchester
University of Nottingham
University of Oxford
University of Sheffield
University of Southampton

Other capacity

Newcastle University – Electronics
Lancaster University – Optoelectronic devices
Loughborough University – Healthcare manufacturing (materials for implants)
Queen Mary University of London – Materials for radio frequency and microwave
University of Bath – Semiconductors, nanomaterials
University of Exeter – Metamaterials and grapheme
University of Glasgow – Organic electronics

University of St Andrews – Polymer optoelectronics, quantum nanomaterials, energy materials
University of Strathclyde - Gallium nitride, organic/Inorganic LEDs, hosts the UK Fraunhofer institute in photonics
University of Surrey – Nanomaterials, Electronic materials

Industry

Given the importance of research undertaken by private companies in this area, we have included a selection of the largest and most significant companies who undertake materials research.

BP
GSK
Jaguar Land Rover
Johnson Matthey
Morgan Advanced Materials
Procter & Gamble
Rolls Royce
Tata Steel
Unilever

SMEs

Applied Graphene Materials
Ilika
Nanoco
Nexeon
Revolymer

Learned societies

Institute of Materials, Minerals and Mining
Institute of Physics
Royal Academy of Engineering
Royal Society
Royal Society of Chemistry

Leadership forums and networks

These are groups and networks, which help facilitate and co-ordinate materials research

AMSCI Composites Innovation Cluster
Automotive Council
Composites Leadership Forum
Graphene Innovation Leadership Board
Knowledge Centre for Materials Chemistry
Materials KTN
RR-EPSRC Partnership on Advanced Metals for Aerospace Applications

National facilities and equipment

These are facilities, which either exist for the use of national bodies or are available for the general use of the academic community.

Advanced Forming Research Centre
Advanced Manufacturing Research Centre
Aerospace Technology Institute
Centre for Process Industries
Culham Centre for Fusion Energy
Diamond Light Source
Defence Science and Technology Laboratory
ISIS
Materials Processing Institute
National Centre for III-V Technologies
National Composites Centre
National Nuclear Laboratory
National Physical Laboratory
Nuclear AMRC
Manufacturing Tech Centre
Research Complex at Harwell
SuperSTEM (Daresbury)
Surrey Ion Beam Centre
The EPSRC National Facility for High-Resolution and Magnetic Single-Crystal Diffraction
The EPSRC National Service for Electron Paramagnetic Resonance Spectroscopy
The EPSRC National Solid State NMR Service
The EPSRC UK National Service for X-ray Photoelectron Spectroscopy
The Thomas Youngs Centre
The UK National Crystallography Facility
The Welding Institute
UK 850 MHz High-Field Solid-State NMR Facility
Warwick Manufacturing Group

International facilities

Facilities which are either partly funded by UK institutions or important to UK research.

Advanced Test Reactor at Idaho
European Spallation Source (ESS) that is currently under construction in Lund.
European Synchrotron Radiation Facility (ESRF)
Institut Laue-Langevin (ILL)
NIST Centre for Neutron Research
Spallation Neutron Source at Oak Ridge
The Free Electron Laser FELIX at Nijmegen
The Jules Horowitz Centre
The Petten Reactor
XFEL (x-ray free electron laser) at Hamburg (UK present via HIBEF consortia (EPSRC/STFC)

Collaborative Research Centres and Institutes

BP-International Centre for Advanced Materials (University of Manchester)

The International Centre for Advanced Materials (ICAM) is a BP-funded research centre leading research that seeks to advance the fundamental understanding and use of advanced materials across a variety of energy and industrial applications, including oil and gas. The 10 year investment programme is expected to support 25 new academic posts, 100 postgraduate researchers and 80 postdoctoral fellows. (More info: www.icam-online.org/)

Location		Funding	Research area		Eight Great	Industrial Strategy
UK	Global	Private Sector	Engineering	Physical, mathematical and computer sciences	Advanced Materials	Oil and Gas

Cambridge Graphene Centre (University of Cambridge)

The Cambridge Graphene Centre will investigate the science and technology of graphene, carbon allotropes, layered crystals and hybrid nanomaterials. The Centre will promote research with an emphasis on applications, particularly focussed on flexible and bendable devices. More info: http://www.graphene.cam.ac.uk/)

Location	Funding			Research area		Eight Great	Industrial Strategy
UK	Private Sector	Departmental	Research Councils	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

Centre for Materials Discovery (University of Liverpool)

Working with collaborators from the University of Liverpool, other institutions and commercial organisations, the Centre delivers accelerated synthesis, formulation and characterisation programs across a variety of application areas and industries. The Centre focusses on energy-related applications, polymers, porous materials and nanomaterials.

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Private Sector	Academic	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

Dalton Nuclear Institute (University of Manchester)

The Dalton Nuclear Institute works to enhance the supply of affordable, low carbon energy world-wide by delivering the cross-disciplinary research required to address key challenges in the field of nuclear energy across the entire fuel cycle. It also offers undergraduate courses and postgraduate qualifications in nuclear energy. (More info: www.dalton.manchester.ac.uk/)

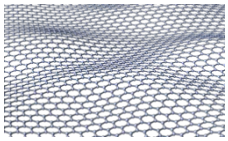
Location	Funding	Research area		Eight Great	Industrial Strategy
UK	Research Councils	Engineering	Physical, mathematical and computer sciences	Advanced Materials	Nuclear

EPSRC Centres for Innovative Manufacturing

The EPSRC Centres for Innovative Manufacturing aim to maximise the impact of innovative research for the UK, supporting existing industries and opening up new industries and markets in growth areas. There are 16 Centres, many of which incorporate aspects of novel materials research, including additive manufacturing, photonics and composites. (More info: http://www.epsrc.ac.uk/research/centres/innovativemanufacturing/)

Location	Funding	Research area		Eight Great		Industrial Strategy	
UK	Research Councils	Engineering	Biological and medical sciences	Robotics and Autonomous Systems	Synthetic Biology	Aerospace	Life Sciences

Graphene Engineering Innovation Centre (University of Manchester, not yet operational)



Announced in September 2014, the new £60m GEIC facility will develop commercial applications related to graphene and 2D materials. The GEIC will focus on pilot production and characterisation, together with application development in composites, energy, solution formulations and coatings, electronics, and membranes. (More info: http://www.manchester.ac.uk/discover/news/article/?id=12777)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Private Sector	Departmental	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

London Centre for Nanotechnology (Imperial College/ UCL)

Opened in 2006, the London Centre for Nanotechnology is a UK-based multidisciplinary enterprise operating at the forefront of science and technology. It is a collaboration between University College London and Imperial College London. The aim of the Centre is to solve global problems in information processing, healthcare, energy and environment through the application of nanoscience and nanotechnology. Materials research includes superconductors, bio-inspired materials and composite materials. (More info: www.london-nano.com/)

Location	Funding		Research area		Eight Great				Industrial Strategy
UK	Academic	Departmental	Biological and medical sciences	Synthetic Biology	Regenerative Medicine	Advanced Materials	Quantum Technologies	Oil and Gas	Life Sciences

Materials Innovation Factory (University of Liverpool)

The Materials Innovation Factory was co-founded by the University of Liverpool, Unilever and HEFCE as part of the UK Research Partnership Investment Fund initiative. It is a new facility which will provide a suite of open access equipment and academic expertise. It will house a set of shared laboratory facilities that will facilitate high-throughput techniques, formulation and high-end analytical techniques such as nuclear magnetic resonance and electron microscopy. (More info: www.liv.ac.uk/materials-innovation-factory/)

Location	Funding			Research area		Eight Great		Industrial Strategy
UK	Academic	Departmental	Private Sector	Biological and medical sciences	Engineering	Synthetic Biology	Advanced Materials	Life Sciences

Maxwell Centre (University of Cambridge, not yet operational)

A new £63m Centre, based at the Cavendish Laboratory in Cambridge, which will combine Government and industry funding to foster world-class research in the physical sciences and its translation to industry. Although not currently operational, initial suggestions for materials research work have included superconductive materials. (More info: www.cam.ac.uk/research/news/new-centre-will-bring-together-frontier-physics-research-and-the-needs-of-industry)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Private Sector	Departmental	Physical, Mathematic and Computational Sciences	Engineering	Advanced Materials	

National Graphene Institute (University of Manchester, not yet operational)

The £61m National Graphene Institute (NGI) will aim to be the UK's home of research into the world's thinnest, strongest and most conductive material, providing the opportunity for researchers and industry to work together on a variety of potential applications. The Institute, due for completion in 2015, will feature a 1,500m^2 research lab for University of Manchester graphene scientists to collaborate with their colleagues from industry and other UK universities. (More info: http://www.materials.manchester.ac.uk/our-research/cross-cutting-research/uom/national-graphene-institute)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Departmental	European	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

Polymer Centre (University of Sheffield)

The Polymer Centre is a network of 48 academic research groups located at the University of Sheffield. Research focusses on three themes: electronics and photonics, advanced materials, and manufacturing and biomaterials and healthcare. Materials research includes stimulus responsive materials, nanocomposites and the design, manufacture and testing of commercial composite parts for aerospace. The centre also provides professional training in polymer science. (More info: www.polymercentre.org.uk/)

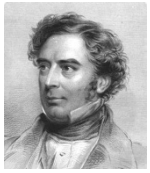
Location	Funding		Research area			Eight Great		Industrial Strategy
UK	Private Sector	Academic	Biological and medical sciences	Engineering	Physical, mathematical and computer sciences	Advanced Materials	Synthetic Biology	Aerospace

SPECIFIC (Swansea University)

SPECIFIC is an academic and industrial consortium led by Swansea University with Tata Steel, NSG Pilkington and BASF as strategic partners. At its heart is the SPECIFIC Innovation and Knowledge Centre, which is funded by the EPSRC, Innovate and the Welsh Government. The main area of research is functional coatings for building materials that can generate and store electricity. (More info: http://specific.eu.com/)

Location	Funding			Research area		Eight Great	Industrial Strategy
UK	Research Councils	Private Sector	Departmental	Engineering	Physical, mathematical and computer sciences	Advanced Materials	Construction

Stephenson Institute for Renewable Energy (University of Liverpool)



The Stephenson Institute for Renewable Energy is dedicated to exploring the future of renewable, clean and sustainable energy technologies. This includes materials research, such as energy saving glass and thin films, and coatings for use in photovoltaic cells. (More info: http://www.liv.ac.uk/renewable-energy/)

Location	Funding	Research area		Eight Great		Industrial Strategy
UK	Academic	Earth Sciences	Engineering	Energy Storage	Advanced Materials	Offshore wind

Academia

In addition to the collaborative centres hosted at individual universities, many academic institutions have thriving materials groups, undertaking independent research. A brief guide to those top 12 institutions deemed by EPSRC (and citation data) to have a critical mass in advanced materials research areas is provided.

Imperial College, London

Materials Science and Engineering at Imperial College London touches on a wide range of internationally-leading research programmes in the synthesis, processing, and modelling of a broad range of materials (e.g. metals, semiconductors, glasses and functional materials) directed to diverse applications such as nuclear, aerospace, biomedical and electronics. Imperial also host Centres for Doctoral Training in Theory and Simulation of Materials, Plastic Electronics and Advanced Characterisation.

University of Birmingham

The school of Metallurgy and Materials at the University of Birmingham focusses research in areas of alloy processing, characterisation and modelling, engineering properties of materials and functional materials processing. Facilities available include electron microscopy and characterisation techniques.

University of Bristol

Materials research at Bristol is distributed across Physics (Quantum Photonics, Micro- and Nanostructural Materials), Chemistry (Functional Nanomaterials, Biomaterials and Nanoscale Architectures) and Engineering (Advanced Composites Centre for Innovation and Science). The latter brings together composites activities across the University of Bristol, based in the Faculty of Engineering and linked to the Science and Medical Faculties. Bristol also hosts Centres for Doctoral Training in Advanced Composites, Composites Manufacture & Functional Materials, as well as strategic equipment in Composites Innovation obtained through EPSRC's capital for great technologies (Advanced Materials).

University of Cambridge

Research in Advanced Materials at Cambridge spans Engineering, Physical Sciences (Cavendish Lab) and ICT (CAPE). The Department of Materials Science & Metallurgy also has a large and active research school, closely linked with industrial needs (with major research sponsors such as Rolls-Royce, Regenesys Technologies and Pfizer). Research activities and expertise includes areas such as graphene, gallium nitride and plastic electronics. Cambridge host Centres for Doctoral Training in graphene technology and functional nanomaterials.

University College London

The Centre for Materials Research at UCL was established to provide a focal point for materials research at UCL. Key strengths include computational materials science, materials chemistry, nano and functional materials as well as biomaterials and technology for healthcare engineering. UCL benefits from other interdisciplinary centres that focus on areas related to materials research. These include the London Centre for Nanotechnology and the Thomas Young Centre that links theoretical and computational approaches to materials research throughout several London institutions.

University of Leeds

The Institute for Materials Research encompasses several major themes including carbon, electroceramics, novel and rapidly solidified alloys, steels and photonic materials. Leeds also has a strong capability in medical devices and tissue engineering within the institute for medical and biological engineering, which includes facilities for testing materials for implants.

University of Liverpool

The materials chemistry team at Liverpool is discovering new classes of functional organic, inorganic and hybrid materials and leveraging the interaction between computation and experiment to access better materials faster. The Centre for Materials Discovery works with collaborators from other institutions and commercial organisations to deliver accelerated synthesis, formulation and characterisation programs across a variety of application areas and industries.

University of Manchester

The School of Materials at the University of Manchester has a breadth and depth of expertise together with state-of-the-art facilities, the combination of which provides a platform for world-class research. Manchester hosts centres for Doctoral training in graphene and materials for demanding environments, as well as strategic equipment in nanoengineering obtained through EPSRC's capital for great technologies call. Research areas include ceramics, polymers and biomaterials

University of Nottingham

The Department of Mechanics, Materials and Manufacturing is one of the leading departments of its kind and has close involvement with industry. Research work in the Materials, Mechanics and Structure division spans a range of applications including medicine, aerospace and automotive engineering, energy and the construction industry. The programme benefits from extensive modern laboratory facilities which support experimental programmes. The University also hosts materials-relevant EPSRC Centres for Innovative Manufacturing in Composites and Additive Manufacturing, as well as strategic equipment in multifunctional additive manufacturing composites innovation obtained through EPSRC's capital for great technologies (Advanced Materials) call.

University of Oxford

The Materials Department at Oxford has research activities in carbon nanomaterials, materials for quantum computing and materials for nuclear energy. These activities are underpinned by pilot scale facilities (hosted at the Begbroke Science Park) and expertise in the characterisation of materials. Oxford also hosts strategic equipment in multifunctional high performance alloys obtained through EPSRC's capital for great technologies (Advanced materials) call.

University of Sheffield

Sheffield University hosts the Advanced Manufacturing Research Centre and the Nuclear Advanced Manufacturing Centre, both parts of the UK HVM Catapult. Sheffield also hosts Centres for Doctoral Training in Polymers, Soft matter & Colloids and Advanced Metallic Systems.

University of Southampton

Southampton University conducts research across a wide range of engineering materials with applications in aerospace and automotive sector, energy systems, electronic and biomedical devices and microsystems. Southampton also hosts the Optoelectronics Research Centre and the EPSRC Centre for Innovative Manufacturing in Photonics, where pioneering research is performed on optical materials, fibres and metamaterials. The University also hosts strategic equipment in development and manufacture of advanced composites obtained through EPSRC's capital for great technologies (Advanced materials) call.

Other capacity

Other academic institutions undertaking research in materials science

- Newcastle University – Electronics
- Lancaster University – Optoelectronic devices
- Loughborough University – Healthcare manufacturing (materials for implants)
- Queen Mary University of London – Materials for Radio Frequency & Microwave
- University of Bath – Semiconductors, Nanomaterials
- University of Exeter – Metamaterials and Graphene
- University of Glasgow – Organic electronics
- University of St Andrews – Polymer optoelectronics, Quantum Nanomaterials, Energy Materials
- University of Strathclyde - Gallium Nitride, Organic/Inorganic LEDs, hosts the UK Fraunhofer institute in photonics
- University of Surrey – Nanomaterials, Electronic materials

Companies

BP

Based in London, BP was founded in 1909 and now employs over 80,000 people. It helped fund the BP International Centre for Advanced Materials (featured above) at Manchester University, where research focusses on structural materials, smart coating and separations. (More info: www.bp.com/)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Engineering	Advanced Materials	Oil and Gas

GlaxoSmithKline (GSK)

GSK is a British multinational pharmaceuticals company with revenue of over £25bn and employing approximately 100,000 people. Its global headquarters are in Brentford and it has large sites for both R&D and manufacturing at other locations in the UK. It recently announced £500m of funding for manufacturing facilities in Ulverstone, UK. (More info: http://www.gsk.com/)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Biological and medical sciences	Advanced Materials	Life Sciences

Jaguar Land Rover (JLR)

Employing over 26,000 people worldwide, JLR is the UK's largest automotive manufacturing business and also the biggest UK investor in R&D in the manufacturing sector. It has its headquarters in Whitley, Coventry and has recently formed a research partnership with the Warwick Manufacturing Group at Warwick University. (More info: http://www.jaguarlandrover.com/gl/en/)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Engineering	Advanced Materials	Automotive

Johnson Matthey

Johnson Matthey was founded in 1817 and now has operations in over 30 countries and employs around 12,000 people worldwide. It has a number of Technology Centres in the UK, the largest of which is located at Sonning Common in Reading. This Centre produces nano and fine metal powders, and addresses a range of functional materials including catalysts and energy materials (e.g., batteries and fuel cells). It also hosts one of the UK's most powerful electron microscopes. (More info: http://matthey.com/)

Location		Funding	Research area		Eight Great	Industrial Strategy
 UK	 Global	 Private Sector	 Engineering	 Biological and medical sciences	 Advanced Materials	 Life Sciences

Morgan Advanced Materials (MAM)

MAM was founded in 1856 in South London and is now a FTSE 250 company with 10,000 employees operating in over 50 countries. It is split into two divisions: Morgan Engineered Materials and Morgan Ceramics. Between these two divisions the company supplies healthcare, transport, defence, energy petrochemical and industrial markets. (More info:**Error! Hyperlink reference not valid.** and www.morgantechnicalceramics.com/)

Location		Funding	Research area	Eight Great	Industrial Strategy	
 UK	 Global	 Private Sector	 Engineering	 Advanced Materials	 Automotive	 Aerospace

Procter & Gamble

Founded in 1837 and based in Ohio, Proctor & Gamble is an American multinational consumer goods company. It employs over 120,000 people worldwide including approximately 8,000 scientists. An example of materials research is the use of non-woven substrate technology in baby care products. (More info: http://www.pg.com/en_UK/)

Location		Funding	Research area	Eight Great	Industrial Strategy
 UK	 Global	 Private Sector	 Biological and medical sciences	 Advanced Materials	 Life Sciences

Rolls Royce

Rolls Royce was founded in 1906 and is now a FTSE 100 company, employing over 50,000 people, producing aero engines for both civil and military use. It undertakes extensive materials research independently at the Advanced Manufacturing Park also works with all the Advanced Manufacturing Centres as well as global research partners. Research areas include heat-resistant and lightweight materials. (More info: http://www.rolls-royce.com)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Engineering	Advanced Materials	Aerospace

Tata Steel

Tata Steel was founded in 1907 and is an Indian steel producing company. It serves many markets including aerospace, automotive, shipbuilding and construction and last year was Europe's second largest steel producer. Its main UK research sites are in Rotherham at the Swindon Technology Centre (although this is under threat of closure) and at the Automotive Engineering Centre at Warwick University. (More info: http://www.tatasteel.com/)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Engineering	Advanced Materials	

Unilever

Unilever was formed in 1929 and currently employs over 170,000 people worldwide. It undertakes materials research privately at six labs, two of which are located in the UK at Colworth and Port Sunlight, and in partnership with Liverpool University at the Centre for Materials Discovery. (More info: www.unilever.co.uk/)

Location		Funding	Research area	Eight Great	Industrial Strategy
UK	Global	Private Sector	Biological and medical sciences	Advanced Materials	Life Sciences

SMEs

There are a number of SMEs operating in the area of advanced materials and 5 examples have been chosen below to give some indication of the diverse areas that these businesses cover.

Applied Graphene Materials

AGM produces high purity graphene using a continuous process and believes that the commercial value of graphene lies in its ability to transfer its properties to other materials to enhance their performance. They provide dispersion and product integration expertise to a wide range of applications.

Ilika

Ilika accelerates the development of new materials for energy and electronics applications through the use of its patented, high throughput techniques. Ilika's technology enables functional materials to be made, characterised and tested faster than traditional techniques.

Nanoco

Nanoco's patented molecular seeding process allows for production of uniform, high quality quantum dots on a large scale. Nanoco's quantum dots are differentiated from other quantum dot technologies as they do not contain heavy-metals.

Nexeon

Nexeon is a battery materials and licencing company with a unique silicon anode technology. This technology uses silicon to deliver increased capacity without compromising lithium-ion battery cycle life, providing lighter batteries with more power and longer lifetime between charges.

Revolymer

Revolymer is a technology company that designs, develops and formulates novel polymers to improve the performance of existing consumer products within the fast moving consumer goods (FMCG) and other industrial markets.

Learned societies

Institute of Materials, Minerals and Mining (IOM^3)

IOM^3 is a major UK engineering institution whose activities encompass the whole materials cycle. From exploration and extraction, through characterisation, processing, forming, finishing and application, to product recycling and land reuse. It exists to promote and develop all aspects of materials science and engineering, geology, mining and associated technologies, mineral and petroleum engineering and extraction metallurgy, as a leading authority in the worldwide materials and mining community. The Institute is also a member of the UK Science Council. (More info: http://www.iom3.org/)

Location	Funding	Research area			Eight Great	Industrial Strategy
UK	Charity	Physical, Mathematic and Computational Sciences	Engineering	Earth Sciences	Advanced Materials	

Institute of Physics (IoP)

The institute of Physics is a scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of around 50,000 and is based in London. It is governed by an elected council of up to 25 members and one of its subsidiaries, IoP Publishing, publishes more than sixty academic journals. (More info: www.iop.org/)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Departmental	Charity	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

Royal Academy of Engineering (RAEng)

Founded in 1976, the UK's national academy for engineering has over 1500 Fellows and 30 Academy Research Chairs in post, each with the support of an industrial co-sponsor. It also takes a lead on engineering education in the UK and aims to "advance and promote excellence in engineering". (More info: http://www.raeng.org.uk/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK		Engineering	Advanced Materials	

Royal Society

Founded in 1660, the Royal Society is the National Academy of Science in the UK. A major activity of the Society is identifying and supporting the work of outstanding scientists. The Society supports researchers through its early and senior career schemes, innovation and industry schemes, and other schemes. The Society facilitates interaction and communication among scientists via its discussion meetings, and disseminates scientific advances through its journals. The Society also engages beyond the research community, through independent policy work, the promotion of high quality science education and communication with the public. (More info: https://royalsociety.org/)

Location	Funding	Research area			Eight Great	Industrial Strategy
UK		Engineering	Biological and medical sciences	Physical, mathematical and computer sciences	Advanced Materials	

Royal Society of Chemistry (RSC)

A not-for-profit organisation, the RSC has over 49,000 members and is the UK's professional body for chemical scientists. It has partnerships with organisations, including P&G, BP Castrol and Unilever. As a professional body it maintains professional qualifications and provides information and advice on issues involving the science and practice of chemistry. More info: http://www.rsc.org/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK		Physical, mathematical and computer sciences	Advanced Materials	

Leadership forums and networks

Advanced Manufacturing Supply Chain Institute Composites Innovation Cluster

The AMSCI CiC will manage 13 integrated capability projects across 25 partners and aims to deliver a holistic supply chain model which will extend throughout the composites community. The aim is to support the delivery of a nationally connected network of composite knowledge and technology providers. The CiC Project is led by the new Cytec Industrial Materials (Heanor, UK) partnered by Axillium and Composites UK (More info: http://the-cic.org.uk/news/amsci-funding-approved-composites-innovation-cluster)

Location	Funding		Research area	Eight Great	Industrial Strategy	
UK	Private Sector	Departmental	Engineering	Advanced Materials	Automotive	Aerospace

Automotive Council UK

The Automotive Council was established in 2009 to enhance dialogue and strengthen co-operation between UK government and the automotive sector. It has developed a sector strategy which addresses the cross-cutting objectives of improving access to finance, support for emerging technologies, skills development, and developing supply chains. Its technology working group provides advice to the Council on UK automotive R&D investment opportunities and analyses, amongst other things, the future technology needs of the sector. (More info: http://www.automotivecouncil.co.uk/what-is-the-automotive-council/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental		Advanced Materials	Automotive

Composites Leadership Forum (CLF)

Driven by the 2009 Strategy for UK Composites, the CLF was set up in 2012 from an industry initiative to coordinate and connect the activities of the growing number of composite-using companies, supportive stakeholders and industry organisations. CLF is chaired by industry with members drawn from industry sector groups, Government and stakeholders and delivery partners. (More info: http://compositesleadershipforum.com/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Research Councils	Departmental	Engineering	Advanced Materials	

Graphene Special Interest Group (SIG)

Launched in January 2014, The Graphene SIG aims to provide a focal point for the exploitation of graphene by UK industry. SIG will organise events and activities which aim to build an active community to help drive graphene innovation in the UK. (More info: https://connect.innovateuk.org/web/graphene-special-interest-group)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental		Advanced Materials	

Knowledge Centre for Materials Chemistry (KCMC)

The goal of the KCMC is to enhance UK capability to develop and commercialise new materials to meet future industry requirements. KCMC is an industry-led partnership with the knowledge base, supported by investment from four research institutions (Universities of Liverpool, Manchester and Bolton, and the STFC Daresbury Laboratories) and Innovate UK. Aligned with the industry strategy of the Chemistry Growth Partnership, KCMC provides flexible resources to facilitate cross-sector working on chemistry-enabled new materials innovation. (More info: http://materialschemistry.org.uk/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Departmental	Private Sector	Physical, mathematical and computer sciences	Advanced Materials	

Materials Knowledge Transfer Network (KTN)

The Knowledge Transfer Network comprises a number of communities that stimulate innovation in the UK's key technology sectors by promoting collaboration, best practice and knowledge sharing between industry and academia. By encouraging partnerships and teamwork, these communities aim to position the UK as the innovation engine for Europe. (More info: https://connect.innovateuk.org/web/materialsktn)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental		Advanced Materials	

RR-EPSRC Partnership on Advanced Metals for Aerospace Applications

This Partnership is a 10-year, £10m programme including the Universities of Cambridge, Birmingham and Swansea with spokes to Sheffield and Imperial College. It provides a UK focus for metallurgical research in gas turbines across the aerospace, marine and energy sectors. (More info: http://www.rrepsrcmetals.co.uk/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Departmental	Private Sector	Engineering	Advanced Materials	Aerospace

National facilities and equipment

Advanced Forming Research Centre (AFRC)

Located in a bespoke facility next to Glasgow International Airport, the AFRC is a collaboration between industry and Strathclyde University, which focuses on developing forming and forging technologies to support the design and manufacture of products, across a range of sectors including Aerospace, Automotive, Energy, Medical Devices and Marine. It houses over £16m worth of equipment in eight laboratories and two workshops. (More info: www.strath.ac.uk/afrc/)

Location	Funding		Research area		Eight Great	Industrial Strategy	
UK	Departmental	Private Sector	Engineering	Biological and medical sciences	Advanced Materials	Aerospace	Automotive

Advanced Manufacturing Research Centre (AMRC)

Funded by the HVM catapult and based at the University of Sheffield, the AMRC focuses on advanced machining and materials research for aerospace and other high-value manufacturing sectors. It employs over 200 highly qualified researchers and engineers. Key areas of research include advanced structural testing of components and innovative manufacturing techniques for composite materials. (More info: www.amrc.co.uk/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Private Sector	Departmental	Engineering	Advanced Materials	Aerospace

Aerospace Technology Institute

The Aerospace Technology Institute exists to protect, exploit and position leading advanced UK capabilities, preserving design and manufacturing jobs in the UK. ATI is currently a 'virtual' centre, in that it does not as yet host onsite research and development projects. (More info: www.ati.org.uk/the-centre/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Private Sector	Departmental		Advanced Materials	Aerospace

Centre for Process Innovation (CPI)

The Centre for Process Innovation is a UK-based technology innovation centre and is part of the High Value Manufacturing Catapult. The Centre uses applied knowledge in science and engineering combined with state of the art development facilities to enable clients to develop, prove, prototype and scale up the next generation of products and processes. Research areas include thermal technologies and printable electronics. (More info: www.uk-cpi.com/about/)

Location	Funding			Research area		Eight Great	Industrial Strategy
UK	Departmental	European	Private Sector	Engineering	Biological and medical sciences	Advanced Materials	

Culham Centre for Fusion Energy (CCFE)

CCFE (formerly known as UKAEA Culham) is the UK's national laboratory for fusion research. It is based at Culham Science Centre in Oxfordshire, and is owned and operated by the United Kingdom Atomic Energy Authority. In addition, CCFE hosts the world's largest magnetic fusion experiment, JET (Joint European Torus), on behalf of its European partners. The JET facilities are collectively used by European fusion scientists, with around 350 European scientists visiting each year to conduct research, and many from outside Europe. (More info: www.ccfe.ac.uk/)

Location	Funding		Research area	Eight Great	Industrial Strategy
UK	Research Councils	European		Advanced Materials	Nuclear

Diamond Light Source (DLS)

DLS is the UK's Synchrotron and is operated by Diamond, a not-for-profit limited company funded as a joint venture by the UK Government through the Science & Technology Facilities Council (STFC) in partnership with the Wellcome Trust. The synchrotron is free at the point of access through a competitive application process, provided that the results are in the public domain. Over 3000 researchers from both academia and industry use Diamond to conduct experiments, assisted by approximately 500 staff. (More info: www.diamond.ac.uk/Home.html)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Research Councils	Departmental	Engineering	Physical, mathematical and computer sciences	Advanced Materials	

Defence Science and Technology Laboratory (DSTL)

DSTL is a Trading Fund of the Ministry of Defence which provides government with research and technical support for UK defence and security. DSTL research is wide-ranging, including for example big data, medical and forensic sciences with defence applications, as well as defence technology. It has four bases, with headquarters at Porton Down, Wiltshire, and employs around 3,300 people. (More info: [www.dstl.gov.uk)](http://www.dstl.gov.uk)

Location	Funding	Research area		Eight Great				Industrial Strategy
UK	Departmental	Physical, mathematical and computer sciences	Engineering	Advanced Materials	Big Data	Automation and Robotics	Satellites	Aerospace

ISIS

ISIS is a centre for research in the physical and life sciences at the [STFC Rutherford Appleton Laboratory](#) near Oxford. Its suite of neutron and muon instruments provides insights into the properties of materials on the atomic scale. It supports a national and international community of more than 3000 scientists for research into subjects ranging from clean energy and the environment, pharmaceuticals and health care, through to nanotechnology and materials engineering, catalysis and polymers, and on to fundamental studies of materials. (More info: www.isis.stfc.ac.uk/index.html)

Location	Funding		Research area			Eight Great	Industrial Strategy
UK	Research Councils	Private Sector	Physical, mathematical and computer sciences	Engineering	Biological and medical sciences	Advanced Materials	

Materials Processing Institute (MPI)

The MPI is a not-for-profit company, providing industrial research and development services to the materials and processing industries. Based in Teesside, the Institute started from the original British Iron and Steel Research Association (BISRA) established in 1945, and for 70 years has provided high quality research with national and international collaborators. Partners include the Universities of Sheffield and Durham, Tata Steel, Harsco and the Centre for Process Innovation. (More info: www.mpiuk.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Engineering	Advanced Materials	Construction

National Centre for III-V Technologies

The EPSRC National Centre for III-V Technologies provides services for the provision of III-V epitaxial materials, structures and devices to enable the UK University Community to compete at the highest levels. The Centre offers comprehensive capability in all the main III-V materials combinations, and covers the full range from narrow band gap to wide band gap materials and structures, grown by molecular beam epitaxy and metal-organic vapour phase epitaxy techniques. As well as the main focus of epitaxy, a full device fabrication service is offered. (More info: www.epsrciii-vcentre.com/Home.aspx)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

National Composites Centre (NCC)

The NCC was established in response to the UK Government's UK Composites strategy in 2009 that highlights the importance of composites to the future of UK manufacturing and the Government's plans for ensuring that the UK has the means to succeed in intensely competitive global markets. The NCC, based in Bristol, aims 'to be an independent, open-access national centre that delivers world-class innovation in the design and rapid manufacture of composites and facilitates their widespread industrial exploitation'. (More info: www.nccuk.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental	Engineering	Advanced Materials	

National Nuclear Laboratory (NNL)

Founded in 2008 the NNL is a UK Government owned nuclear services provider covering the whole of the nuclear fuel cycle. The three core areas on which their operations focus are: waste management and decommissioning, fuel cycle solutions and reactor operations support. They have a number of sites, the largest of which is The Central Laboratory, located at Sellafield. (More info: www.nnl.co.uk/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	Nuclear

National Physical Laboratory (NPL)

Established in 1900, the NPL is the national measurement standards laboratory for the United Kingdom, based at Bushy Park in Teddington, London, England. It is the largest applied physics organisation in the UK and employs over 550 scientists. NPL also offers a range of commercial services, applying scientific skills to industrial measurement problems, and manages the MSF time signal. (More info: www.npl.co.uk/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental	Physical, mathematical and computer sciences	Advanced Materials	

Nuclear Advanced Manufacturing Research Centre (NAMRC)

Also funded by the High Value Manufacturing Catapult and based at the University of Sheffield, the NAMRC is a collaboration of academic and industrial partners from across the civil nuclear manufacturing supply chain, with the mission of helping UK manufacturers win work at home and worldwide. Key areas of research include large scale welding and cladding, robotic machining and large-scale metrology. The NAMRC also provides a range of targeted support programmes in skills and training. (More info: http://namrc.co.uk/)

Location	Funding			Research area	Eight Great		Industrial Strategy
UK	Private Sector	European	Departmental	Engineering	Advanced Materials	Automation and Robotics	Nuclear

Manufacturing Technology Centre (MTC)

The MTC is housed at Ansty Park, Coventry and specialises in a range of manufacturing technologies and processes that are particularly important to the high value manufacturing sector: Intelligent Automation, Advanced Tooling and Fixturing, Simulation and Informatics, Electronics Manufacturing, High Integrity Fabrication and Additive Manufacturing. It is an open access centre and works with companies of all sizes. (More info: www.the-mtc.org/)

Location	Funding		Research area	Eight Great		Industrial Strategy
UK	Departmental	Private Sector	Engineering	Advanced Materials	Automation and Robotics	

Research Complex at Harwell

Harwell Oxford is a world-class centre for science, technology and innovation, where there are a number of world-class scientific facilities and leading-edge research. In particular, the campus hosts the Rutherford Appleton Lab, Central laser Facility, UKAEA, ISIS (state of the art neutron source) and the Diamond Light Source (which has a separate entry). (More info: www.rc-harwell.ac.uk/)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Research Councils	Academic	Engineering	Biological and medical sciences	Advanced Materials	

SuperSTEM (Daresbury)

SuperSTEM is the EPSRC National Facility for Aberration-Corrected Scanning Transmission Electron Microscopy. It supports a wide variety of multi-disciplinary research by providing access to cutting-edge instrumentation, state-of-the-art data analysis as well as expertise and training in electron microscopy. Access to SuperSTEM is open to UK academics and their collaborators within the world-wide scientific community. It is administered by an academic consortium, led by the University of Leeds and joined by the Universities of Glasgow, Liverpool, Manchester and Oxford. (More info: http://superstem.com/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

Surrey Ion Beam Centre

The IBC aims to promote and facilitate world class research in the field of ion beam applications for the UK academic and industrial communities. The IBC allows users to undertake a wide variety of research using ion implantation, ion beam analysis (IBA) and microbeam analysis. The IBC also has extensive processing and characterization facilities that can be made available to IBC customers. (More info: www.surrey.ac.uk/ati/ibc/)

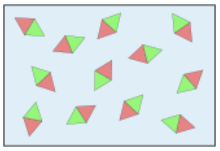
Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

The EPSRC National Facility for High-Resolution and Magnetic Single-Crystal Diffraction

Originally conceived as a tool to probe magnetic materials, this mid-range facility, managed by the Universities of Liverpool and Warwick, now has 20 active UK research groups (representing approximately 100 researchers) covering research in materials science, physics, chemistry, soft condensed matter and biomaterials. The facility focusses on societal challenges such as energy storage and recovery, the digital economy and advances in healthcare technologies as well as underpinning the UK research infrastructure. (More info: www2.warwick.ac.uk/fac/cross_fac/xmas/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

The EPSRC National Service for Electron Paramagnetic Resonance Spectroscopy



The EPSRC National Service for Electron Paramagnetic Resonance Spectroscopy is a mid-range facility for the characterisation of paramagnetic materials. Electron Paramagnetic Resonance is a key requirement for many areas of chemistry and materials science in which new materials are produced and studied, either by direct synthesis or extraction from natural sources. (**Error! Hyperlink reference not valid.**)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

The EPSRC National Solid State NMR Service

The EPSRC National Solid State NMR Service is a ‘free at the point of access’ facility providing access to expertise and state-of-the-art instrumentation in the field of solid-state NMR and includes both data collection and interpretation services. The Service is capable of handling a wide variety of sample types and offers a wide range of experimental techniques. Access to the Service is regulated and prioritised initially by expert Service staff and overseen by a Steering Committee. (More info: www.dur.ac.uk/solid.service/epsrc_service/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

The EPSRC UK National Service for X-ray Photoelectron Spectroscopy (XPS)

A midrange facility hosted by Newcastle University to provide UK wide free-at-the-point-of-service XPS facilities. This nexus facility has a remit to provide the best specification commercially-available facilities for XPS in terms of energy resolution, lateral resolution and angular resolution available from laboratory-based instruments worldwide. The Service provides internationally leading collaborative XPS analysis, training, data sharing and remote access. (More info: www.ncl.ac.uk/nanolab/research/themes/nexus/user.htm)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences	Advanced Materials	

The Thomas Youngs Centre (TYC)

The TYC is an interdisciplinary alliance of approximately 100 London-based researchers from four universities: Imperial College, King's College, QMUL and UCL. It aims to address the challenges of society and industry through the theory and simulation of materials, or materials modelling. The Centre offers training, provides consultancy and has a number of long term partnerships. (More info: www.thomasyoungcentre.org)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector	Physical, mathematical and computer sciences	Advanced Materials	

The UK National Crystallography Facility (NCS)

The UK NCS is an amalgamation of resources comprising laboratory-based facilities in the Chemical Crystallography Laboratory at the School of Chemistry, University of Southampton, together with provision of a synchrotron-based facility on station I19 at the Diamond Light Source. It provides data collection and analysis services for crystallography experiments, from routine analyses to more specialised setups. They have crystallographic expertise in house and full structure analysis for those who would like the data refined and solved. (More info: www.ncs.ac.uk/)

Location	Funding		Research area		Eight Great	Industrial Strategy
UK	Research Councils	Departmental	Physical, Mathematic and Computational Sciences	Engineering	Advanced Materials	

The Welding Institute

Based in London, the Welding Institute is the leading professional engineering institution responsible for the professional registration and certification of welding and joining personnel worldwide. It consists of a professional institution, a certification body, a training organisation and a world renowned research and technology centre. (More info: www.theweldinginstitute.com)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Departmental Private Sector	Engineering	Advanced Materials	

UK 850 MHz High-Field Solid-State NMR Facility

This facility follows a £3.7m grant from EPSRC and BBSRC to a consortium of UK universities. The facility, a 850 MHz wide-bore solid-state NMR system (4 channel HFXY with 11 MAS (1.3 to 7 mm) and static probes), is sited in the Magnetic Resonance Centre at Millburn House, University of Warwick, and has been operational since February 2010. (More info: www2.warwick.ac.uk/fac/sci/physics/research/condensedmatt/nmr/850/)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Research Councils	Physical, mathematical and computer sciences Engineering	Advanced Materials	

Warwick Manufacturing Group (WMG)

WMG was founded in 1980 and today has an annual programme of £180m and over 450 people working on the five sites at Warwick University. It also has collaborative centres in India, China and Malaysia and is partly funded by the HVM catapult. Key areas of materials research include lightweight structures and volume integration of polymer structures. (More info: www2.warwick.ac.uk/fac/sci/wmg)

Location	Funding	Research area	Eight Great	Industrial Strategy
UK	Private Sector Departmental Academic	Engineering	Advanced Materials	Automotive

International facilities

There are a number of facilities based outside of the UK, which are, or may well be in the future, important for materials research in the UK. These are listed below with a website where further information can be obtained:

- Advanced Test Reactor at Idaho (www.inl.gov/research/advanced-test-reactor-research/)
- European Spallation Source (http://europeanspallationsource.se)
- European Synchrotron Radiation Facility (www.esrf.eu/)
- Institut Laue-Langevin (www.ill.eu)
- NIST Centre for Neutron Research (www.ncnr.nist.gov/)
- Spallation Neutron Source at Oak Ridge (www.sns.gov/)
- The Free Electron Laser FELIX at Nijmegen (www.ru.nl/felix)
- The Jules Horowitz Centre (www.cad.cea.fr/rjh/JHR-CP/index.html)
- The Petten Reactor (www.emtr.eu/hfr.html)
- XFEL (x-ray free electron laser) at Hamburg (www.xfel.eu/)