Innovation
Knowhow
Capability
Midlands Opportunities in Advanced Materials
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Welcome to the Midlands

The Midlands is one of the most dynamic areas in the UK. Located at the heart of a connected transport network, it has close proximity to London and access to 75% of the UK within 2 hours.

Home to over 10 million people and 800,000 businesses, the region includes the cities of Birmingham and Nottingham alongside Coventry, Derby, Hereford, Leicester, Lincoln, Stoke-on-Trent, Wolverhampton and Worcester.

Our local economy is worth more than £200 billion, generating nearly 13% of the UK’s Gross Value Added (GVA), and experiencing growth of 18% over the last five years. We’re home to 27,500* businesses in advanced manufacturing, employing 246,100. We export £55bn worth of goods to 178 countries*, growing at a rate in excess of the national rate. The Midlands is indeed an engine of growth at the heart of the UK.

The home of Shakespeare, Robin Hood, JRR Tolkien and Sir Isaac Newton is today at the centre of plans for a new high speed rail network and an innovation hub for advanced manufacturing, automotive, life sciences, digital technologies and rail technologies.

Birmingham Airport handles over 13 million passengers across 140 routes annually, while East Midlands Airport is the UK’s second largest cargo handler. In total, 45% of British rail freight and 33% of heavy road freight goes to, from or through the Midlands.

The region has the fastest improving rail network in Europe and by 2033 will be the hub of the country’s new HS2 high speed rail network – expanding capacity and connecting to London in less than 50 minutes.

The region’s 20 universities support a world-class science and innovation base making the region a global centre of excellence in areas such as advanced manufacturing, engineering, low carbon and autonomous technologies, healthcare, life sciences and agri-food and drink.

A high quality of life also attracts people to live, work, study and invest here, with the Midlands region blessed with five Areas of Outstanding Natural Beauty, two UNESCO World Heritage Sites and a thriving culture of sport, music and the arts.

*Midlands Engine Vision for Growth
The Midlands at a Glance

£200bn+
GVA

10m+
Population

2m+
People educated to degree level

20-24 years old is the largest demographic group

20
Universities

+ 600
Materials companies

The Midlands accounts for over a quarter of all UK materials companies*

- Leading in Turnover - with 25% of all UK materials turnover
- Leading in Employment - with almost 30% of all UK materials employment

Ranked 1st for Metals
With a third of all UK metals companies based in the Midlands

Ranked 1st for Polymers
Almost a quarter of all UK polymer companies call the Midlands their home

Ranked 1st for Ceramics
With almost 40% of all UK ceramics companies in the Midlands

Ranked 2nd for Composites
Over 17% of all UK composites companies are based in the region

Opportunities in Materials

Materials have been identified as critically important to underpin high value manufacturing, drive innovation and address socio-economic “grand challenges”. The growth rates in all materials subsectors are a result of the drivers and demands in key user sectors as they strive to meet future challenges and the ability of existing and new materials to enable these challenges to be met.

These key challenges include:

Durability - There is demand in numerous sectors for new and improved materials with enhanced engineering properties (for example yield, strength, ductility and toughness), improved performance and better durability. Structures are being deployed in more extreme and challenging service environments but must continue to demonstrate their reliability and performance.

This increasing drive for improved materials durability has opened up a whole new field of research where materials are designed with tailored performance criteria for specific applications. The desire for improved durability is not, however, just about the development of new materials, it is also about optimising the performance characteristics of existing materials, taking into consideration environmental and mechanical conditions as well as time. To be truly durable, materials must retain their performance characteristics, at least for the duration of the structure’s design life.

For example, some of the most challenging environments on Earth can be found in operational nuclear reactors and, as a result, there has been extensive effort to develop materials that can withstand high operating temperatures, high levels of irradiation and highly aggressive chemicals. Specific examples here would include improvement to zirconium alloys, the main material currently used in fuel-element casing, and development of refractory molybdenum alloy casings.

* Materials Landscaping Study, Innovate UK, March 2018
Lightweighting - Global trends in resource efficiency and CO₂ reduction are two of the key drivers behind the growth in the development and deployment of new and improved lightweight materials across numerous industry sectors such as aerospace, automotive, construction and renewable energy. The aerospace industry is currently the biggest user of lightweight materials with almost 80% of all materials used in aircraft, such as aluminium, magnesium, plastics and composites, being lightweight. The automotive industry is expected to make rapid gains in the use of lightweight materials as OEMs strive to reduce overall vehicle weight to improve fuel consumption and reduce emissions. These materials will also underpin the transition to hybrid and fully electric vehicles. Together, these are creating opportunities across the supply chain for companies with the relevant skills and capabilities.

Functionality - Functional materials already play an important role in a number of sectors, particularly IT where they facilitate computation, communication, storage and the display of information. They are also becoming increasingly important in sectors such as aerospace, automotive, medical devices, packaging and construction. Smart and intelligent material systems are finding applications in the food sector, such as highly functional packaging, and in medical devices, including 'track and trace' for better regulatory adherence. As well as functionality of the bulk material, there have been significant on-going developments in functional coatings and this is an area where there will be numerous opportunities across a wide range of sectors and applications. Examples include: active layers (such as photovoltaic technology and catalytic surfaces); switching surfaces (such as switching between hydrophobic/hydrophilic behaviour, colours and electrical conduction/non-conduction); and anti-fouling surfaces (such as the lotus effect, photocatalytic self-cleaning and non-toxic maritime anti-fouling).

Sustainability and Recyclability - Many of the above challenges and the opportunities they present will, by their very nature, focus on technical performance. However, sustainability is becoming an increasingly important aspect of materials design and a requirement to “do more with less” is underpinning a branch of materials research focusing on materials recycling, reuse and substitution. Across the range of industries where sustainability and recyclability is important, there are numerous opportunities for companies that can develop new materials and associated recovery processes for existing materials that are difficult to treat, meeting the needs of end-users but also taking into account environmental impacts. For example, the recycling of carbon fibres, particularly those impregnated with resin, presents a significant challenge. The majority of composites are made using thermoset matrices, such as epoxy, that cannot be melted or reshaped after they are cured—there is, therefore, a need for new processes that are able to address this issue.

A summary of the key challenges and potential materials development opportunities are shown below:

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Customer Sectors</th>
<th>Development Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightweighting</td>
<td>Automotive, Construction, Maritime, Defence</td>
<td>Advanced, lightweight alloys</td>
</tr>
<tr>
<td></td>
<td>Aerospace, Renewables, Oil and gas, Maritime</td>
<td>Engineering polymers based on advanced formulation and additives</td>
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<tr>
<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>New and improved carbon and glass fibre polymer composite formulations</td>
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<tr>
<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>Advanced, aluminium based metal matrix composites</td>
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<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>Super tough, ultra thin glasses</td>
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<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>Multi-functional coatings with the ability to “switch” functionality</td>
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<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>Development and application of secondary raw materials</td>
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<td></td>
<td>Maritime, Industrial manufacturing, Maritime, Energy</td>
<td>High performance, natural fibres</td>
</tr>
<tr>
<td>Sustainability &amp; Recyclability</td>
<td>Construction, Automotive, Alternative power generation</td>
<td>Advanced concretes and cements with reduced environmental impacts</td>
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<td></td>
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<tr>
<td>Functionality</td>
<td>Construction, Automotive, Alternative power generation</td>
<td>Advanced and improved nanomaterials and coatings for renewable power generation (e.g. photovoltaics)</td>
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These challenges align with the three major themes of materials for the low-carbon economy, the circular economy and energy generation and transmission as identified by the Advanced Materials Leadership Council, which is established by the UK Government to enable accelerated development of advanced materials applications for the benefit of the UK economy.
Access to Major Materials Markets

The Midlands is traditionally viewed as the UK’s leading region to ‘make things’. It’s no surprise the Midlands is home to many globally significant material users such as Jaguar Land Rover, Rolls Royce, Bombardier, JCB, PepsiCo, Müller, Toyota and Alstom to name a few. These users are supported by strength and depth in the supply chain by leading materials manufacturers such as GKN, Magna International, Dynamic Materials and Morgan Advanced Materials. To stay ahead and remain globally competitive, the region is embracing new manufacturing methods and new materials.

Leading Midlands companies include:

- 3M
- ABB
- Airbus Defence & Space
- Alstom Transportation
- Aria Foods
- Aston Martin
- Bombardier
- Walgreens Boots Alliance
- Caterpillar
- Doncasters Group
- GE
- GKN
- Jaguar Land Rover
- JCB
- Müller
- PepsiCo
- Rolls-Royce
- Siemens
- Toyota
- Triumph Motorcycles
- Unilever
- Walkers Snack Food
- UTC Aerospace

The following sectors are critically dependent on materials:

**Automotive - Gearing up for the future**

- The Midlands accounts for 40% of all UK automotive production.*
- £1.5 billion (over 60%) of UK based automotive R&D is spent in the region.*

The Midlands area is the driving force behind the UK’s automotive sector, employing over 60,000 skilled workers. The region’s historic traditions in the sector have attracted the highest concentration of Tier 1 and 2 suppliers of anywhere in the UK and it is home to 16 of the world’s top 20 global automotive brands including Jaguar Land Rover, Toyota, Aston Martin, JCB, Morgan and BMW. Autonomous vehicles will soon appear on the streets of the Midlands, as the UK government has given cities such as Coventry the go-ahead to host trials of driverless cars.

*SMMT Industry Facts

**Rail & Aerospace - Advanced manufacturing for the 21st Century**

- 20% of the UK’s manufacturing output comes from the region, providing one third of UK manufacturing jobs.
- The Midlands accounts for over 20% of England’s exports, the majority of this coming from manufactured goods.

Expertise in the Midlands extends across advanced materials, machinery and digital production. With the location of Europe’s largest rail cluster in Derby, the region offers huge supply chain opportunities in this sector alone, with Bombardier having been awarded a contract worth over £1 billion to supply carriages for London’s Crossrail project. 25% of the UK’s aerospace industry also operates in the Midlands including Rolls-Royce, the world’s second largest manufacturer of jet engines.

**Life Sciences - At the heart of medical research**

- The Midlands hosts the largest number of medical technology companies in the UK
- The sector employs over 500,000 people, selecting from a local talent pool of graduates in medicine, biochemistry and medical engineering.

The Midlands is at the cutting edge of the UK life sciences sector. 50 NHS Trusts and 50 major hospitals, the second largest medical school in the UK and the Institute of Translational Medicine in Birmingham along with BioCity, Europe’s largest life sciences incubator in Nottingham, form a great cluster. Companies like Walgreens Boots Alliance, 3M, Novartis, Pfizer and Bayer are quick to appreciate this. The Midlands is also a leading region for clinical trials.
Bombardier Transportation is the UK’s leading rail engineering and manufacturing company. Its design, engineering and manufacturing teams produce a comprehensive range of rail equipment, from signalling and rolling stock to complete transportation systems. The company’s Derby operation in Litchurch Lane is its global centre of excellence in aluminium train technology, forming an integrated works where trains are designed as well as assembled. This site is also globally recognised for its development of electromagnetic compatibility (EMC) testing, systems integration and human factor analysis / ergonomics.

JCB, headquartered in Rocester, Staffordshire, is one of the world’s top three manufacturers of construction equipment and a leading global supplier of agricultural equipment. JCB Compact Products Ltd, designs and manufactures a range of compact construction equipment including micro, mini and midi excavators from 0.8 to 10 tonnes, which sell in large volumes around the world. JCB Power Systems Ltd designs and manufactures diesel engines for a range of ‘off highway’ construction, industrial & agricultural equipment sectors, covering the 55kW - 225kW (74HP - 300HP) power category. The company moved into producing engines in 2004 to power its own machines and today more than 70% of all the company’s products are fitted with the JCB engine. Since engine production began, JCB has produced more than 350,000 engines, secured a diesel land speed record and developed a great British business.

Rolls-Royce continues to invest in world class technology and in 2016 invested £1.3 billion in research and development. It supports a global network of 31 University Technology Centres (UTC) including 19 centres in the UK. This helps position Rolls-Royce engineers at the forefront of scientific research and provides access to a wealth of talent and creativity to help protect Rolls-Royce’s capability into the future. An example of a UTC partnership is with the University of Birmingham in materials science to support the development of more efficient aero engines.

Other types of research partnerships include Rolls-Royce collaborating with the University of Birmingham on a High Temperature Research Centre. This centre is a unique casting, design, simulation and advanced manufacturing research facility and is focusing initially on the key design and manufacturing aspects of investment casting.
Excellence in Materials Manufacturing

The Midlands benefits from a significant materials manufacturing industry and a strong and effective industry support infrastructure has developed to grow it. There are over 600 materials companies in the region, which together account for almost 42,000 employees and a combined turnover of £8.5bn.

Metals and Metal Alloys

Metal and metal alloy activity is particularly strong in the Midlands. The region accounts for over a third of all metal producing companies in the UK. This capability is strong in all key metal categories including ferrous metals, aluminium, nickel and magnesium. There is also significant forging and casting capability, supported by downstream processes such as rolling and forming. Decades of technological innovation has resulted in a metals industry in the Midlands that is less labour intensive and more efficient than ever.

Magna

Magna is a company of more than 168,000 entrepreneurial-minded people dedicated to delivering innovative solutions today while defining tomorrow. Magna is a mobility technology company and one of the world's largest suppliers to the automotive industry with 335 manufacturing operations globally. Its competitive capabilities include body exteriors and structures, power and vision technologies, seating systems and complete vehicle solutions. Magna's new plant in Telford utilises its patented vacuum casting process, High-Q-Cast™. High pressure aluminium castings offer the automaker design, mass and quality advantages in key body and chassis structure applications.

Dynamic-Materials

Dynamic-Materials, headquartered in Nottingham, is a group of companies specialising in the manufacture, development and trading of a range of metallic and ceramic composites used in a variety of sectors, including aerospace, defence, automotive, mining, petrochem, energy, construction and medical. The company is a pioneer in 'Rapid Solidification Technology' (RST) that involves 'spinning' molten metal alloy fibres and filaments then quenching at super-fast rates.

Dynamic's metal spinning technology has been used to produce materials for use in development projects such as a lightweight battery application with a global battery manufacturer and also a lightweight, all stainless steel composite sandwich that is half the weight of steel, but with the equivalent stiffness called Fibrecore. The Group has manufacturing and R&D facilities in the heart of the Midlands. The unique materials offered by the company are already used in advanced applications worldwide.
Ceramics

The Midlands is the leading region in the manufacture of ceramic materials, accounting for almost 40% of all the UK ceramics companies, with a clear concentration of companies in Stoke-on-Trent and Staffordshire. Regional excellence ranges across the entire ceramic industry, from decorative and household goods to highly technical ceramics.

The emergence of technical and processing developments such as additive manufacturing, engineering of microstructure at the atomic level and integrated computational materials engineering will create a range of opportunities for the industry and its supply chain. Example opportunities include innovative glass, ceramics and ceramic matrix composites for biomedical applications, energy harvesting/scavenging, solid oxide fuel cells and smart coatings.

World-beating, energy-efficient plants are located in the region. Through its continued commitment to innovation, the ceramic industry in the Midlands is developing low-carbon and resource efficient processes, for example through better kiln design and more efficient firing. This includes the move from intermittent (batch) to continuous (tunnel or fast-fire roller kiln) technology.

Examples of some innovative ceramic suppliers in the Midlands are:

**James Kent Group**

James Kent Group, based in Stoke-on-Trent, is a specialist in technical glass, bespoke preparations and ceramic pigment manufacturing.

The company produces an award winning bioactive glass that has been specifically developed for complete oral care and protection. It helps remineralise tooth surfaces and reduce early stages of sensitivity and tooth decay.

The company continuously looks into subjects such as glazes to protect black refractory in metallurgy, dental and medical glasses. The company is working very closely with universities and other institutes such as the National Nuclear Laboratory on an Innovate UK funded project to develop a better nuclear waste encapsulation glass.

**Jesmonite**

Jesmonite, located in Bishops Castle, Shropshire, is an innovative material solutions company. Its core product, also called Jesmonite, is an acrylic-modified gypsum composite used as a lightweight alternative to traditional materials such as stone and concrete and also as a safe alternative to solvent based resin materials.

Jesmonite is used in a wide range of markets including decorative interior/exterior lightweight architectural elements, film-sets, surface design, cladding panels, furniture, lighting, flooring, artwork and sculpture.

Jesmonite is the ultimate chameleon material of the building industry - it can be used to replicate the appearance and texture of any surface finish in any number of colours. The material was named Material of the Year at the London Design Fair in 2017.
Morgan Advanced Materials

Morgan Advanced Materials is a global engineering company, listed on the London Stock Exchange. It is a world-leader in advanced materials science and engineering of ceramics, carbon and composites. The company operates in a series of well-defined markets where its applications expertise offers customers a valuable differentiator, engineering high-specified materials and components that solve their challenging technical problems.

Morgan has invested in four Centres of Excellence globally, to ensure the company’s continued investment in Research and Development. The Global Materials Centre of Excellence (GMCoE) for Structural Ceramics is one of these, based in Stourport, Midlands.

Currently the GMCoE is focused on additive manufacture (or 3D printing) of ceramics, using layer-wise manufacture to produce complex components that cannot be formed by conventional manufacturing processes.

The initial target application for this technology is the production of components to make air travel more efficient and reduce emissions from gas turbine engines. Future developments are extending capability for complex components into other market applications such as healthcare, instrumentation, transport and industrial sectors.

Haydale

Based in Loughborough, Haydale is a global technologies and materials group that facilitates the integration of graphene and other nanomaterials into the next generation of materials. With expertise in graphene, silicon carbide and other nanomaterials, Haydale can deliver improvements in electrical, thermal and mechanical properties, as well as toughness.

Haydale have received research grants from NATEP, which builds on the successful regional Aerospace Technology Exploitation Programme run by the Midlands Aerospace Alliance, and from Innovate UK. The NATEP-supported GraCELS Project, a collaborative research project involving Haydale, Airbus UK, BAE Systems, Cobham Technical Services and SHD Composites, has led to the production of graphene enhanced electrically-conductive carbon fibre-reinforced composite materials with improved resistance to damage from a severe lightning-strike event.

The Haydale HDPlas™ graphene enhanced material has been used to manufacture an aileron inspired by a design from Airbus for their Eco-Flyer aircraft. The aileron is nearly 4m in length and uses a novel design and manufacturing approach. The aileron was designed and preliminary sized by Airbus and optimized by Stanford University Composites Design Team.
A Culture of Innovation

Innovate UK, the UK’s innovation agency, is responsible for supporting industrial research and technology development. The Midlands received 16.6% of all Innovate UK grants in 2016-17 (a total of £48.8 million) – the largest share across the UK, outside London and the South East of England. In comparison, London received 19% (£56 million) and the South East of England 19.5% (£57.5 million).

Success through Public Funding

Some examples of the materials research undertaken by companies, with support from public funding, are:

World’s largest continuous multi-material nanoparticle manufacturing plant
Nottingham based Promethean Particles manufactures metallic nanoparticles using a novel, continuous hydrothermal process, which is both efficient and environmentally friendly. Innovate UK and EU funding has been critical to its success. Its commercial production facility opened in 2016 and can manufacture >1,000 tonnes p.a., supplying customers in the inks, paints and coatings sectors. The company also has plans to expand into medical and energy applications.

Lightweighting the automotive industry
Hot form quenching (HFQ®) is a world-first forming process to produce lightweight, high strength and complex aluminium parts - avoiding the need to weld smaller parts together. Developed by PAB Coventry and Impression Technologies Ltd, this is now providing parts to leading car manufacturers including Aston Martin, Lotus and Ford from a £6 million plant. PAB has seen its turnover rise significantly, while Impression is looking to licence the technology to global high volume manufacturers in automotive, rail, aerospace and defence sectors.

Recycled cars
Jaguar Land Rover is using up to 50% recycled aluminium in its new cars through a partnership with Novelis (the world’s largest aluminium recycler). The REALCAR project led to the development of a new aluminium alloy that can tolerate higher impurity levels. Novelis has invested £6 million to manufacture these new alloys. Jaguar Land Rover’s ambition is to have 75% recycled aluminium in car body structures by 2020.

Lighter composites for aerospace
Aviation accounts for more than 2% of global carbon emissions. Along with improvements in engine efficiency, decreasing weight is a key objective in reducing pollution. One Midlands Engine company is having a small but significant impact here. Sigma Precision has developed a new range of composite products (SigmaLite) that are half the weight of metal pipes and can be manufactured more easily and in more complex geometric shapes than other composites. There are around 150 such pipes in every jet engine, which means this advance alone can reduce the weight of a twin-engine aircraft by around 50 kg.
World-Class Materials Research

Examples of world-class science in the Midlands includes:

Researchers at the University of Birmingham are developing cutting edge process technologies such as direct laser fabrication (a form of additive manufacturing), powder processing, casting and sintering. This is supported by extensive modelling and characterisation expertise. There are strong connections with the automotive and aerospace industries, such as the joint High Temperature Research Centre with Rolls-Royce.

Warwick University is very much industry-facing. A key partner in the UK's High Value Manufacturing Catapult, it has six centres supporting design, manufacturing and materials development, as well as providing education and training, in particular to the automotive, aerospace and energy sectors. These include international centres for manufacturing and nanocomposites and the UK’s National Polymer Processing Centre. In November 2017, Warwick secured £80 million from the UK Government to establish a National Battery Manufacturing Development Facility for electric vehicles.

The Centre for Additive Manufacturing at the University of Nottingham is developing a plug and play platform for 3D printing and next generation multi-material additive technologies to create fully functional systems rather than components. Automotive and pharmaceutical companies are key clients and partners.

Other centres include: The Aston Institute of Materials Research, The Centre for Manufacturing and Materials Engineering (Coventry), The Advanced Manufacturing Processes and Mechatronics Centre (De Montfort), The Additive Manufacturing Centre (Loughborough), The Materials Technology Integration Centre (Leicester) and The School of Engineering (Wolverhampton).

High Value Manufacturing Catapult

The High Value Manufacturing (HVM) Catapult is a catalyst for the growth and success of UK advanced manufacturing. Working with manufacturing businesses of all sizes and from all sectors, the HVM Catapult helps turn ideas into commercial applications by addressing the gap between technology concept and commercialisation. Its seven centres, two of which are in the Midlands, offer access to world-class equipment, expertise and collaborative opportunities:

- The WMG centre, based in Coventry, is addressing the global challenge of low carbon mobility through R&D in lightweight technologies, propulsion and energy storage.
- The Manufacturing Technology Centre (MTC), also in Coventry, specialises in manufacturing technologies and processes that are particularly important to the high value manufacturing sector, such as intelligent automation and additive manufacturing. Also the MTC is home to the National Centre For Additive Manufacture (NCAM).

Transport Systems Catapult

The Transport Systems Catapult, located in Milton Keynes, is the UK’s innovation centre for intelligent mobility. It undertakes applied research in collaboration with academia and industry into ‘initiative areas’ including connected and autonomous transport, mobility-as-a-service platform and open transport data hubs. The centre is focussed on the following market opportunities:

- Human-centric design to ensure the user is at the heart of new products and services.
- Modelling & visualisation platform models to exploit the way in which new services can be provided and users engage with them.
- Intelligent mobility data hub to drive more intelligent decisions for transport providers and users.
- Operational trials & evaluation to unlock greater capacity and productivity in existing and new infrastructure.
- Critical systems and software development to ensure the UK is at the forefront in this area.
**Medicines Discovery Catapult**

The Medicines Discovery Catapult is a national facility for the discovery and early stage development of medicines. The initiative works in shared R&D projects with partners that want to find new diagnostics, biomarkers and drugs. These include biotech and pharma firms of all sizes, translational researchers, technologists, charity groups, contract researchers and investors. The Catapult can:

- Apply industrial decision making and project management to speed up drug, diagnostic and biomarker projects and enable them to be more readily adopted by industry and investors.
- Apply and test new scientific models of disease and new ways of measuring complex biology.
- Make fragmented data systems work together and harness valuable data to drive better decisions.
- Access the best UK discovery minds to give agile advice to new projects and concepts.
- Broker access to patient samples and patient data to test and prove new biomarkers, diagnostics and software.
- Help patient charities and academics move their good science more quickly into great targeted products.

**Energy Systems Catapult**

The Energy Systems Catapult, based in Birmingham, aims to clear the barriers blocking innovators from bringing new products, services and business models to market. It offers innovators unique capabilities and assets, including:

- Whole systems modelling and analysis - to better understand how innovations can best contribute to energy transition and deliver most economic value.
- Systems integration - to better align innovation activities, products and services with regulators, policy makers, industry incumbents, local authorities, investors and potential future system architectures and business models; while helping assess the potential risks, benefits and economic impacts of innovations and develop associated business cases.
- Test and demonstration - to help innovators develop new technologies, products, services and business models.
- Stakeholder services - to provide targeted knowledge to support innovators in navigating the complex energy market.

**Supported by World Leading Research Organisations**

With several research organisations located in the region, including Lucideon and Smithers Rapra, Midlands companies can draw on their expertise to support materials innovation.

**Smithers Rapra**, headquartered in Shrewsbury, is a premier source of independent plastic and rubber consulting and testing expertise with facilities in the UK, North America and China. Its world-class technical team provides support for every stage of the product lifecycle backed by extensive in-house analytical and testing facilities. It provides:

- Innovative technical solutions.
- Specialists in demanding service environments.
- Experts in cutting-edge material, process and product innovation.
- An ISO 17025 accredited lab-scale environment.

Smithers Rapra works in demanding sectors such as transport, medical device and pharmaceutical products, consumer, energy, advanced materials and components.

**Lucideon** is a development and commercialisation organisation (DCO), specialising in materials technologies and processes. Its application of cross-industry insight, materials science expertise and innovative thinking allows industry to develop and implement disruptive technology platforms, providing cost and/or product performance benefits and enabling real market differentiation. Lucideon Group Limited has three subsidiaries, with headquarters in Stoke-on-Trent. Two examples of the game changing materials and product development currently researched by Lucideon are:

- Development of controlled drug release systems by designing nano material pores that only allow the release of oxycodone, an opioid drug, into the stomach of the patient for rapid pain relief.
- Biodegradable pesticide release systems - currently most fertilisers are released via polymer based technology, however this remains in the environment and is washed into waterways and the wider eco-system. Lucideon is developing alternative inorganic materials to control the release of fertilisers. These materials are biodegradable and break down into constituent elements that are naturally found in the earth.
Why Locate in the Midlands?

The Midlands has a compelling offer of commercial opportunity, affordability, connectivity and quality of life. There are many reasons why the Midlands region represents one of the most exciting investment opportunities in Europe.

- We are the most connected region in the UK, at the heart of the country’s motorway network and, with the busiest railway station outside London, the Midlands is within a four hour commute of 92% of the UK’s population.

- 20-24 year olds are our major demographic, driving the need for new homes and leisure opportunities.

- We are home to high-performing universities producing 100,000 graduates each year. Our 20 universities provide cutting-edge research and a rich talent pool for industry.

- We are a region with rich history and potential for tourism - the birthplace of the industrial steam engine, the first fully mechanised factory and the greatest writer in the English language - William Shakespeare.

- The cultural life of the Midlands is strong with Coventry named the UK City of Culture for 2021 and Birmingham the host city for the 2022 Commonwealth Games.

- The advanced propulsion centre is a £1bn 10 year commitment between government and the automotive industry and is just one example of the strong government support for the region.

Science and Business Parks

The region has world class science and business parks:

**Etruria Valley, Ceramic Valley Enterprise Zone, Stoke-on-Trent**

Etruria Valley is the largest mixed-use business park in North Staffordshire, comprising major office and industrial development opportunities, a significant retail and leisure offering with a 4-star 150 bedroom hotel, restaurants and quality housing. With direct motorway access onto M6 Junctions 15 & 16, the park is strategically located and forms part of the Ceramic Valley Enterprise Zone, allowing occupiers to potentially benefit from enhanced capital allowances. Major companies like bet365, Vodafone, DPD, Wardell Armstrong, Wade Ceramics, GSH Group and HSBC have chosen Etruria Valley.

**Longbridge Technology Park**

This is a £100 million, 40-acre park, home to the Innovation Centre, which is designed to attract technology-based occupiers, with office accommodation, office suites and larger spaces. Also located on the park is the Two Devon Way building, an office building that has been designed for expanding technology-based businesses. Plans are in place to expand Longbridge Technology Park with the aim of making it the Midlands’ leading centre for technology and innovation.
Loughborough University Science and Enterprise Park
Loughborough University Science and Enterprise Park (LUSEP) is one of the UK’s largest science parks, with 700,000 sq. ft. of high quality accommodation for more than 55 organisations and 2,000 people. Existing business clusters on LUSEP include advanced engineering, low carbon technologies and sports technology. The park is home to The Advanced Technology Innovation Centre - 3,000 sq. m. of fully serviced, flexible space for start-ups and growing companies, purpose-designed for collaboration and innovation.

University of Derby Science Park
The University of Derby Science Park is located adjacent to the world headquarters of Rolls-Royce Civil Aerospace and within 15 minutes of global OEMs such as Toyota, Bombardier and JCB. It aims to be home to the most innovative start-ups and growing businesses in the UK and to bring together global companies and small and medium-sized enterprises with leading-edge academic researchers, policy-makers and funders. The Park offers flexible space to cater for almost every business need with offices, studios and workshops of between 200 and 10,000 square feet. Its flexible work space will suit start-ups, early-stage businesses and established high-growth SMEs hoping to establish themselves or expand.

MIRA Technology Park
MIRA Technology Park, Warwickshire, offers space to businesses engaged in research and development within the transport sector. It has 1.75 million sq. ft. (162,500 sq. m) of space spread across a 340 hectare estate and is one of the largest transport technology parks in Europe. It offers test facilities and engineering resources.

Support for Investors

The Department for International Trade (DIT) helps businesses export and grow into global markets. We also help overseas companies locate to and grow in the UK.

We can help with information on how to set up in the UK, provide sector specific information about the materials industry in the UK and support you to identify the right location here for you and introduce you to local partners and supply chains.

Our network of UK specialists includes a team who are based in the Midlands, providing expert local knowledge of projects, potential public and private sector partners and other local business support. Across the Midlands, there are eight government-designated Enterprise Zones.

Benefits available to investors range from simplified planning to business rate discounts for up to 5 years. Individual zones have specific support packages for occupants, related to their sector focus. For example, MIRA Technology Park in Leicestershire is a national centre of automotive R&D excellence. Also, there are 22 science parks across the Midlands all contributing to its cutting-edge research.

The Midlands attracted over 1,000 Foreign Direct Investment projects between 2012 and 2017, creating almost 57,000 new jobs and safeguarding a further 40,000. The region accounted for over 16% of the UK’s overall exports in 2017.
For more information on materials opportunities in the Midlands, please contact: midlandsengine@trade.gov.uk

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