HENRY ROYCE INSTITUTE

ADVANCED MATERIALS RESEARCH & INNOVATION

ROYCE

WELCOME TO ROYCE

ABOUT ROYCE

The Henry Royce Institute is the UK's national centre for research and innovation for advanced materials and was set up through an initial investment of **£260m** from the Department for Business, Energy, and Industrial Strategy (BEIS) via the Engineering and Physical Sciences Research Council (EPSRC). Royce was established to ensure that the UK remains at the forefront of materials research and exploitation through collaborations with industry and academia, and by providing access for the UK materials community to state-of-the-art equipment and facilities. Research undertaken at Royce tackles some of the most pressing challenges facing today's society, from providing energy for future cities to decarbonisation and new recyclable materials. Our materials research facilities and expertise are available to academia and industry alike.

We believe that collaboration between researchers associated with Royce and industry will create real solutions to global grand challenges and provide significant societal and economic benefit to the UK.

Royce brings together world-leading expertise and technical capabilities and works closely with industry to ensure translation and commercialisation of fundamental research. With its Hub at The University of Manchester, the Institute is a Partnership of nine leading institutions – the universities of Cambridge, Liverpool, Leeds, Oxford, Sheffield, Imperial College London, the UK Atomic Energy Authority and National Nuclear Laboratory, and two associate universities, Cranfield and Strathclyde. Royce coordinates over 700 academic, technical and research staff and over £200 million of facilities, providing a joined-up framework that can deliver beyond the current capabilities of individual Partners or research teams. As the Institute transitions from a set-up to operational phase, it has established a clear vision around Advanced Materials for a Sustainable Society.

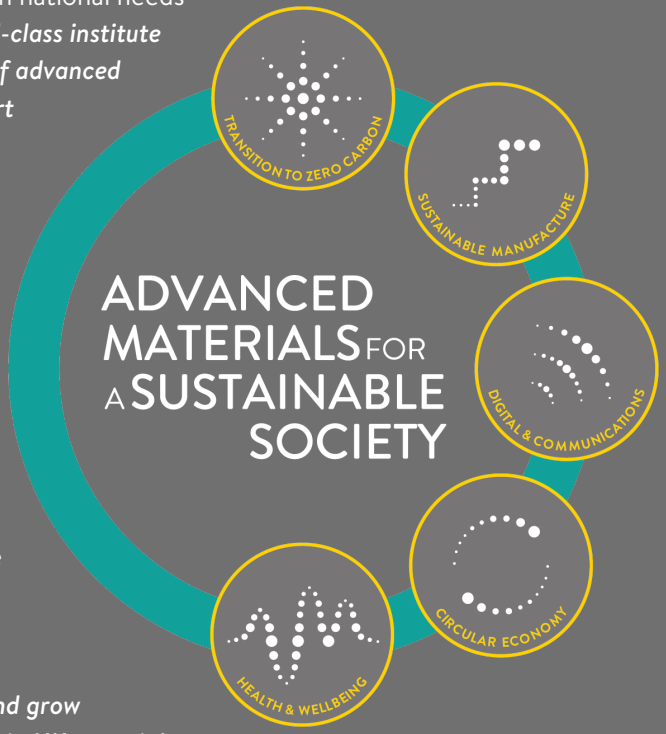
OVERVIEW

Royce works with industry, academia and research technology organisations to help the UK retain and develop our world-leading talent, igniting a new, resilient industrial base to support a changing economy and levelling up regional productivity in the process.

ROYCE VISION

Royce's **vision** is founded on national needs and priorities: ***To be a world-class institute stimulating the innovation of advanced materials research to support sustainable growth and development.***

Meeting this ambition demands output of high-impact research achieved through excellent people, cutting-edge infrastructure, and further development of the ecosystem to stimulate the translation of research through the value chain.



Our **mission** is ***to support and grow world-recognised excellence in UK materials research, accelerating commercial exploitation, and delivering positive economic and societal impact for the UK.***

ROYCE MISSION

Royce delivers its mission through four pillars of activity that support both industry and academia. These activity areas are underpinned by a culture and identity that is flexible, inclusive and collaborative, incorporating both industry and academia in the advanced materials community within and outside of the UK.

Enabling national materials research, collaboration, foresighting and strategy: Working to shape our materials research landscape by convening and connecting the UK materials community, engaging with government and policy-makers, and bridging industrial sectors to ensure maximum impact from the UK's research endeavour.

Providing access to world-leading facilities and research expertise: Providing fast and flexible access for the UK research community to cutting-edge equipment and highly-skilled technical staff to enable high impact research and innovation.

Catalysing industrial collaboration and accelerating translation: Implementing programmes and interventions that meet the challenges of advanced material translation throughout the value chain, from start-ups to SMEs and corporates.

Fostering materials science skills development, innovation training and outreach: Providing professional development to empower the next generation of materials researchers and leaders with technical and business skills through a comprehensive support and outreach programme.

ROYCE

INFRASTRUCTURE & FACILITIES

Royce funding has supported a significant investment in new advanced materials research infrastructure and equipment across Royce Partner locations. These facilities provide an open and collaborative environment for cutting-edge materials research and innovation.

New buildings and equipment in which EPSRC capital has been instrumental include:

ROYCE HUB BUILDING, MANCHESTER

Together the Royce Hub Building and new equipment represents an EPSRC investment of £150 million. Extending over 9 floors, it hosts a range of new lab spaces and equipment including for biomedical materials, metals processing, digital fabrication, and sustainable materials research.

ROYCE DISCOVERY CENTRE (RDC) & ROYCE TRANSLATIONAL CENTRE (RTC), SHEFFIELD

The RDC is home to the latest technologies in 3D additive manufacturing, digital manufacturing and nanocharacterisation. Researchers at the RTC are evolving novel materials and processing techniques, making them accessible for trial by industry collaborators. The facility features a broad range of Royce equipment to enable research into Advanced Metals Processing.

BRAGG CENTRE FOR MATERIALS RESEARCH, LEEDS

Fully operational in 2022, The Bragg Centre for Materials Research will be home to an interdisciplinary laboratory space enabling the discovery, creation, characterisation, and exploitation of materials engineered at the atomic level. The Centre houses the Multi Deposition System; a multi-chamber, multi-technique thin film deposition tool, which allows a range of different materials and growth techniques to be combined.

MATERIALS INNOVATION FACTORY, LIVERPOOL

Royce has invested £10m in Liverpool's new Materials Innovation Factory (MIF) which is dedicated to materials chemistry and formulation. The site houses one of the highest concentrations of materials science robotics in the world, alongside a suite of advanced analytical equipment.

SIR MICHAEL UREN HUB, LONDON

Royce funding has been invested in Imperial College London's recently completed Sir Michael Uren Hub building, in which Royce occupies the eighth floor. Royce facilities here will focus on the production and characterisation of thin films and devices and will include a 140 m^2 clean room.

CENTRE FOR ENERGY MATERIALS RESEARCH, OXFORD

The recently refurbished Rex Richards Building is home to ~1,000m2 facilities for research into air-sensitive energy storage materials. Battery materials and modelling research groups are housed across four dedicated Royce floors. The new equipment and facilities significantly enhance the ability to synthesise, test and characterise air-sensitive materials for batteries and for investigation of electrocatalysts.

MAXWELL CENTRE, CAMBRIDGE

Royce facilities at the Maxwell Centre address energy generation, storage, and use. Equipment is available for fabrication of new battery structures, X-ray photoelectron spectroscopy, X-ray tomography, and electrochemical characterisation. It houses the Ambient Processing Cluster Tool, a series of 12 custom built gloveboxes allowing the design and fabrication of range of battery, PV, LED and other customised materials and devices.

MATERIALS RESEARCH FACILITY, UK ATOMIC ENERGY AUTHORITY

UKAEA's Materials Research Facility (MRF) at the Culham Science Centre hosts a range of Royce equipment for handling, preparing, processing and analysing radioactive samples, including microscopy and mechanical and thermo-physical testing equipment.

NATIONAL NUCLEAR LABORATORY

Capital funding from Royce has enabled NNL to extend its equipment portfolio for both academic and industrial research on active samples, including for glovebox micro-raman spectroscopy, plasma FIB with SIMS capability, hot cell optical microscopy and thermogravimetric analysis-mass spectrometry equipment for Pu science.

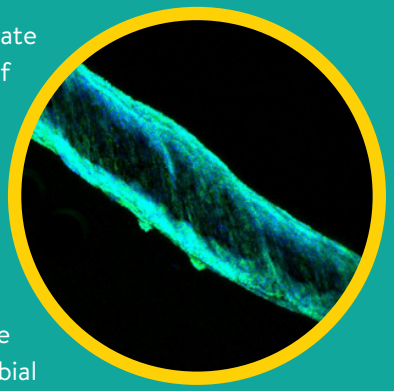
RESEARCH

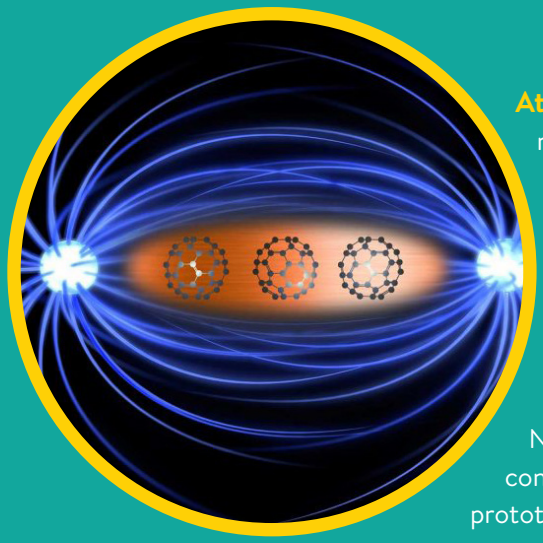
Royce research work is arranged around eight key thematic areas, each championed by a Research Area Lead and supported by a steering group.

Royce is aligned to the UK government Innovation Strategy which sets out Advanced Materials & Manufacturing as a key technology. Our research has the potential to transform the digital, engineering, energy, and health sectors. Royce's research areas are complementary, and our Partner institutions work collaboratively, sharing facilities and expertise.

Advanced Metals Processing provides state-of-the-art facilities in a collaborative environment to deliver innovative metals processing technologies and novel alloy solutions. This theme underpins the High Value Manufacturing Catapult network to provide the UK with more sustainable metal supply chains and accelerate the UK metal industry's transition to a resource-efficient, zero-carbon, digitalised and agile future.

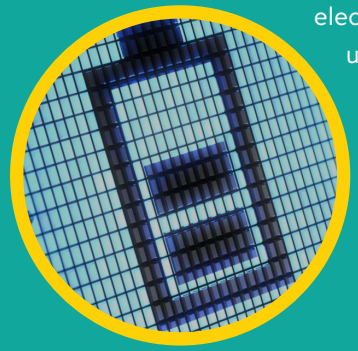
Biomedical Materials aims to accelerate the discovery, manufacture and translation of biomedical materials, devices and Advanced Therapy Medicinal Products. This encompasses the additive manufacturing of hard and soft implants, biomimetic tissue analogues, nanofibres to devices, bioelectronics for biosensing, monitoring and stimulation, and biomechanical evaluation. Key drivers are curative healthcare, sustaining health in an aging population, agile and bespoke manufacture, anti-viral and anti-microbial materials and surfaces for a safer world.





Atoms to Devices focuses on fundamental research into functional thin film materials. This class of material comprises a rich source of components for consumer electronics and communications. They enable devices for generating energy and reducing energy usage; sensors for the Internet of Things and healthcare; and underpin future implementations of quantum technologies. New materials solutions identified also consider viable pathways for scale-up through prototyping to manufacture.

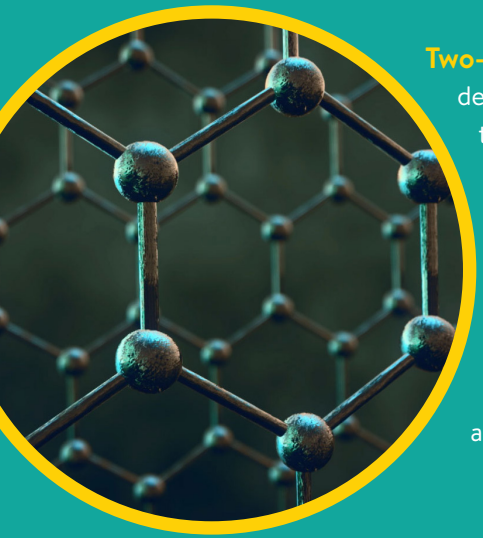
Chemical Materials Design accelerates the formulation of matter with tailored properties (sustainable, electric, magnetic, catalytic, mechanical, etc.). Materials robotics systems focus on automatic synthesis and formulation of molecular, polymeric, composite and inorganic materials, often guided by data-driven or physical models. This theme also aims to rapidly engineer biological systems for the discovery and manufacture of new materials from biology, to design and evaluate sustainable materials, and to develop sustainable packaging solutions.



Electrochemical Systems focuses on fundamental electrochemistry research and device development to underpin scale delivery of batteries in transport and energy systems, and to drive economic supply of green hydrogen and sustainable chemical feedstocks. The research is supported by the continued development of advanced analytical techniques and simulation tools, from atoms to device level.

Material Systems for Demanding Environments delivers new understanding of performance and degradation of structural materials in application-relevant environments. This enables the development of more accurate life prediction and provides a pathway for new structural materials solutions to improve efficiencies and reduce CO_2 emissions in the transport and power generation sectors. The theme also has a particular focus on developing coatings for extending the operation of structural materials to harsher environments.

Nuclear Materials aims to develop the more resilient structural materials needed to withstand the high heat loads and intense radiation environments for fission and fusion; to develop advanced fission fuels more tolerant of severe accidents, both improving safety and allowing simplification of reactor designs; and to develop the materials needed to enable plutonium reuse in fuel and/or disposal as waste.



Two-Dimensional Materials focuses on the smart design of functional materials using atomically thin layers as building blocks, exploiting complementary functionalities of different 2DM layers within a few-nanometre thick heterostructures for high performance electronics and novel devices and systems for low power-consuming ICT systems. It also exploits 2DM in nanocomposites enhancing properties of materials for use in UK's energy, automotive and aerospace sectors.

ACCESSING EQUIPMENT

Royce offers industry and academia the capability to make, test and characterise materials, components and systems. Our state-of-the-art equipment and facilities are open to all, easy to access and technically supported.

FOR INDUSTRY

Royce is open to businesses of all sizes, to help tackle materials challenges, exploit new opportunities, and accelerate research and innovation. From equipment access for commercially sensitive research, to long-term partnerships, Royce can work flexibly and support a range of approaches and needs.

FOR ACADEMIA

Facilities at Royce are open to all UK academics. All Royce Partners have technical and advisory staff providing a single point of entry into facilities across the Royce, enabling you to easily find the right contact.

FUNDING

Facilities can be accessed using a variety of funding sources, including research council grants. In addition there is funding available to support proof-of-concept research, and training and equipment use for PhD students.

Royce can support individual research projects as well as contribute to larger programme grants, manufacturing hubs, European projects and national challenge funding.

The Royce SME Equipment Access Scheme is also open to UK-based SMEs, spin-outs and start-ups and offers subsidised facilities access, perfect for businesses seeking solutions to materials analysis obstacles.

To browse and search a detailed inventory of equipment, visit our website.

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Contact Royce to find out more about how we can help your organisation, and to discuss how our facilities and expertise can support your Research, Development and Innovation requirements.

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