Technology Strategy Board
Driving Innovation

Results of competition: Technology Inspired - Collaborative R&D - Advanced Materials

Total available funding for this competition was £7.4m from the Technology Strategy Board and EPSRC.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Advanced Hall Sensors Limited (lead) Compound Semiconductor Technologies Global Limited Renishaw PLC University of Manchester	High performance III-V semiconductor materials for magnetic Hall Effect sensors	£425,490	£273,913

Project description (provided by applicants)

A Hall Effect sensor is a transducer that varies its output voltage in response to a magnetic field. It is used in a wide range of applications for proximity switching, positioning, speed detection, and current sensing. Typical Hall sensors are manufactured from silicon but are limited in terms of sensitivity and temperature operating range as a result of the fundamental material properties.

This project brings together a consortium of SMEs (Advanced Hall Sensors, Compound Semiconductor Technologies), Manchester University and a UK global metrology player, Renishaw, in order to develop a new family of industrial measurement products based on a novel material as an alternative to Silicon.

The new sensor concept uses compound semiconductor materials based on Gallium Arsenide which are engineered to use quantum effects for superior performance in real world, high-resolution metrology applications.

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Composites Evolution Ltd (lead) SHD Composite Materials Limited Delta Motorsport Limited kscomposites Cranfield University Jaguar Land Rover Limited	Carbon/biocomposite hybrid vehicle structures for reduced weight, cost and environmental impact (CARBIO)	£494,967	£221,777

Project description (provided by applicants)

The CARBIO project will develop automotive structures with reduced weight, cost, environmental impact and improved noise, vibration and harshness (NVH) by the incorporation of novel flax-bioepoxy composites into carbon fibre components.

The need to reduce vehicle weight is leading to the adoption of carbon fibre, which is expensive, energy/CO2 intensive, difficult to recycle and can lead to poor NVH. Flax fibres are low cost, renewable, CO2 neutral and have excellent vibration damping properties, whilst bio-based epoxy resins offer enhanced toughness and sustainability over synthetic epoxies.

This project will develop and optimise flax/carbon hybrid biocomposite materials and test them according to automotive OEM specifications. A number of case study parts, such as a door, wheel arch panel and seat structure, will be designed and validation parts will be produced and tested.

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DePuy International Limited (lead) Gencoa Limited University of Liverpool	Advanced titanium implants: controlled nanotopographies for dual-regulation of bacterial and mammalian cell adhesion	£496,473	£333,511

Project description (provided by applicants)

The aim of this project is to develop a high impact reduction in the risk of failure for orthopaedic implants by controlling the nano-topography of Ti implant surfaces. The project will build on two recent separate areas of research in nano-features and nano-patterns. The project will exploit recent technological innovations in nano-fabrication to develop a novel nano-topography.

The project is led by the global market leader in orthopaedic implants, with technical leaders in nano-fabrication and nano-characterisation. This project will develop: nano-patterned surface structures; the manufacturing method to industrially and economically generate the requisite complex surface structure; and assess the potential performance of a prototype implant surface.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
DZP Technologies Ltd (lead) National Physical Laboratory Limited	Printed transparent graphene electrodes for large-area, low-cost, flexible electronics technology (PrintGraphene Technology (PGT))	£369,869	£201,888

Project description (provided by applicants)

Graphene is the new wonder material recently discovered and pioneered in the UK and now investigated by researchers all over the world. This project proposes the development of new multifunctional, high-value, low-cost, conductive graphene inks, that will be used to manufacture large-scale flexible, transparent electrodes, printed on a range of industrially relevant substrates such as silicon, metals and polymers. These electrodes will have applications in many areas, such as high technology displays, mobile devices, lighting and photo-voltaics.

The project will be a partnership between DZP Technologies, a UK SME with extensive expertise in developing and printing conductive inks, and the National Physical Laboratory (NPL), the UK's National Measurement Institute with leading expertise in graphene surface characterisation and metrology.

The development of these flexible electrodes will add value to the UK economy through job creation and increased business investment in an emerging technology area. These graphene electrodes would also pave the way for the replacement of current electrode materials which are expensive, unsustainable and less suitable for flexible electronics. The new products will also be more environmentally friendly because they will be produced at low temperatures using aqueous and non-toxic solvents.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PVOH Polymers Ltd (lead) Carclo Technical Plastics Limited Unilever UK Central Resources Limited University of Warwick	PVOH composite active packaging	£524,999	£346,698

Project description (provided by applicants)

This project aims to deliver step-change developments in material composition and manufacturing capability of complex biodegradable and water soluble plastic components that will transform existing supply chains in terms of resource efficiency and environmental impact. This break-through of novel active-self-packaging materials technology will potentially enable decentralisation of manufacturing capability in a range of industrial sectors, a supply chain innovation that Technology Strategy Board funding has already demonstrated to yield substantial reductions in environmental impacts, including road transport and associated emissions.

In the first instance this project will seek to deliver resource efficiency in the laundry product supply chain, using decentralised manufacture of unit dose products to reduce road transport, enable the elimination of detergent builders and encourage the implementation of low temperature wash additives through novel active-self-packaging materials.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Rolls-Royce plc (lead) Hot Coatings Limited Teesside University	High-Value high-temperature materials for Electrical Machines (HiVEM)	£494,520	£324,590

Project description (provided by applicants)

This project is concerned with developing the materials and associated manufacturing technology required to enable electrical machines, motors and generators to operate at temperatures some 200-300C higher than is currently possible. This will overcome an intrinsic limitation which has limited the environments in which it is possible to use electrical machines since their initial development more than 150 years ago.

There are a number of important applications in which this is expected to be of real significance. For example, in the design of civil aircraft engines to enable them to be more fuel efficient - by integrating the electrical and turbine components; in the extraction of energy from geothermal sources where the underground temperature might be as high as 500C, and to allow the extraction of oil from low pressure reserves deep underground or from oil sands requiring the application of superheated steam to enable the oil to flow and be pumped to the surface - where we may require pumps to operate at temperatures of 350C or more. Such materials may also allow us to design and operate more conventional motors at higher power without failure, enabling smaller and lighter motors to be incorporated into domestic appliances such as washing machines, reducing cost and with the resultant benefits to the environment.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Scapa Group Plc (lead) Gencoa Limited University of Liverpool	Stimuli-responsive smart wound dressings	£499,075	£334,376
Project description (provided by applicants)			
This project will see a collaboration of Scapa Group Plc, Gencoa Limited and the University of Liverpool's Surface Science Research Centre embark on a program of research and development in order to apply novel techniques for the development of a world-leading antimicrobial wound dressing. Chronic wound infections are increasingly common as a result of ageing populations and increasing rates of obesity and related diseases such as diabetes. Such wounds can commonly become infected via formation of biofilms. It is the purpose of this project to develop a dressing with the capability to intelligently release antimicrobial agents into an affected wound only when they are required to stop biofilm formation. This level of capability does not currently exist in the market and a successful project will create a world first and world leading pre-production prototype. This advance builds on recent technological innovations in nano-fabrication and surface nano-functionalisations of soft materials applicable in this sector.			