Innovate UK

## Results of Competition: Materials and Manufacturing up to 12 Month Projects
## Competition Code: 1605_SC_MM_R1

### Total available funding for this competition is £5M from Innovate UK

**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 |
|---|---|---|---|
| **C-Tex NTX Ltd** | Cost effective online colour monitoring system for real time inspection of patterned textiles | £91,754 | £64,227 |
| **Project description - provided by applicants** | | | |
| ~1-6% of textiles are rejected due to colour variance resulting in costly production delays, customer claims and limiting access to the emerging & rapidly developing retailer market for dynamic stock management. Existing quality control methods are primarily off-line inspection of physical samples which are slow, inspect <0.25% of the textile and result in costly product waste. Whilst online spectrophotometer inspection systems exist, they are not widely adopted due to cost and inability to process patterned textiles. Building on a recently launched MEMS sensor technology and through the adoption of a novel digital technology approach, the project will develop a market first solution for real time online continuous and complete colour inspection of patterned textiles. The system will result in colour data roll maps enabling quality assurance, grouping of rolls based on similarity of colour, and advanced production planning. System development and testing will be undertaken in collaboration with two UK textile manufacturers. The new solution will lead to step changes in competitiveness and productivity for UK manufacturing: i) competitive advantage against discounted bulk manufacture abroad through the offer of 'fast, small batch production with minimal errors' addressing emerging retailer needs; and ii) enhanced productivity through application for mid-process quality control ensuring value is only added to correctly coloured materials thereby increasing first time yield (manufacturing capacity) and reducing process costs. The technology is also transferable to other sectors including plastics, packaging films & coatings | | | |

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| **West of England Textiles Company Ltd** | Development of a novel process to improve the quality & competitiveness of British woollen cloth (S2S) | £99,887 | £44,949 |
| **Project description - provided by applicants** | | | |
| The project aims to develop an innovative manufacturing system that produces a step change in the quality of woollen textile manufactured from British wool enabling it to be incorporated into a number of sectors (apparel, home and automotive furnishings) for export as high value products to Japan, US and China. The British luxury industries is a growing market with around 78% destined for overseas market. The project will diversify existing British wool cloth that are of coarser quality than cloth manufactured from state of the art imported higher cost Australian wool enabling it to be used for the new high end export market. Our principle innovation lies in the application of existing laser and vacuum steam technologies into the textile sector to improve the softness of the wool fibre and reduce its diameter to enable cloth which matches the quality of imported wool. The project will result in an increase in West of England's manufacturing productivity and a step change in our competiveness as we will manufacture higher value British textiles with increased export potential.. The project will also see financial benefits to the whole UK supply chain which are mainly SMEs from farmers, wool processors, weavers, cloth finishers and cloth converters who turn the cloths into a range of products. | | | |

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| **Hiflux Ltd**<br>Imperial College London<br>ECM Developments Ltd | Novel Manufacture of Heat Exchangers | £411,149 | £324,378 |
| **Project description - provided by applicants** | | | |
| Hiflux Ltd designs and manufactures revolutionary compact heat exchangers which recover up to 90% of waste heat in demanding high temperature and pressure applications. Hiflux technology has been proven in industrial field trials in markets such as small-scale combined heat and power, automotive, clean waste processing and hybrid energy systems. The heat exchanger technology features fine arrays of small pins laser welded between thin sheets arranged in a structure that combines strength to withstand pressure loads and flexibility to accommodate large thermal gradients. The resulting structure has a high level of material integrity but the automation is limited by the use of pulsed YAG laser technology. This project addresses how the process of manufacture, developed for small volumes, can be evolved so that Hiflux can demonstrate a clear path to economically viable high volume manufacture. Hiflux, together with project partners Imperial College and ECM Developments Ltd will investigate new ways of using continuous wave fibre lasers to achieve an optimal balance between throughput, initial capital expenditure, energy usage and total cost of ownership. The project will also examine the merits of adapting the manufacture techiques to production of high temperature micro-pin heat exchangers in combination with electro-chemical machining. | | | |

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| **JRI Orthopaedics Ltd**<br>TWI Ltd | OrthoSculpt | £190,177 | £136,906 |
| **Project description - provided by applicants** | | | |
| Total hip replacement (THR) surgery is a common procedure, with over 80,000 procedures done each year in England and Wales. There are two types of implants: those that use bone cement and those that are cement free and bond directly to the bone called 'uncemented'. JRI, the lead on this project, pioneered uncemented THR in the 80s and it has been highly successful. Following two reports by Lord Carter and Prof Briggs in 2016, the suggestion is that uncemented THR should be used less often and only in younger and more active patients – based on cost alone. OrthoSculpt looks to develop an innovative manufacturing technique that should make the cost of the two types of implants closer, which will allow more patients to have the uncemented version. This technique is based on a novel technology owned by TWI, a UK research organisation, called Surfi-Sculpt®. With Surfi-Sculpt, a porous surface can be added to an implant by 'moving' the metal on its surface using an electron beam. This will make small shapes like spikes and triangles that will engage with the bone and stimulate the bone cells to grow into the structures, thus eradicating the need for bone cement. Surfi-Sculpt is both fast and can be applied to individual components, so it is perfect for small batches as well as customised implants. JRI should be able to increase its sales of hip replacements by 4% by 2021 through this advance, with more patients being treated with uncemented hip replacements. We also believe that other industries will find benefit from this rapid, novel manufacturing process for surface preparation, including heat exchangers. | | | |

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| **Ionix Advanced Technologies Ltd**<br>Doosan Babcock Ltd | Direct-bonding of piezoelectric transducers for high temperature structural health monitoring | £99,984 | £67,900 |
| **Project description - provided by applicants** | | | |
| In this project, Ionix Advanced Technologies and Doosan Babcock will test the feasibility of manufacturing a new type of sensor for monitoring the integrity of high temperature plant used in power stations and the oil & gas industry. The new sensor design requires a piezoelectric ceramic material to be bonded directly to the steel of the vessel or pipe to be monitored. As current methods for bonding the ceramic to steel are unsatisfactory, the project will investigate 3 new manufacturing methods.<br>The new sensors enabled by theis process will allow continuous monitoring and detection of corrosion and cracks in operational plant without the need to shutdown the plant on which they are deployed. This will simultaneously improve safety and reliability whilst reducing costs to the operator and consumers. | | | |

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| **InnoLas (UK) Ltd**<br>Loughborough University | Efficient Use of Advanced Materials by Laser Processing (EffaLas) | £99,941 | £78,824 |
| **Project description - provided by applicants** | | | |
| There is an increasing use of high performance coatings (like thermal barrier coatings) most of which are not compactable with conventional de-coating techniques. Selective removal of these coating is essential for manufacturing, repair and reuse of the high value coated components including aerospace turbine blade. The most widely used coating removal techniques for coated parts is acid etching which will be restricted to a large extent under the REACH legislation and more importantly, open loop laser coating removal processing has the risk of damaging the substrate components. In this project, a novel adaptive turn-key laser coating removal system will be developed which can achieve right-first-time coating removal on most engineering materials. | | | |

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| **Acidophil Ltd**<br>Isomerase Therapeutics Ltd | Innovative, manufacturing design to synthesize natural product derivatives | £161,125 | £112,787 |

**Project description - provided by applicants**

Some plants, fungi and bacteria produce chemicals (natural products or NPs) with potent bioactivity as part of their chemical ecology. These NPs have excellent activity against human diseases, crop- and animal- pests. However, they are complex molecules, naturally made in small quantities, so they can be challenging and expensive to produce, significantly limiting their market potential. Currently, they are produced through a combination of fermentation to make a NP which is then modified into the final product via one or more chemical steps. By starting from what nature provides, only very restricted chemistries are accessible, which can make the manufacturing process more complex, hazardous and expensive. Acidophil and it's strategic partner, Isomerase are developing an innovative process of manufacturing NP medicines, starting with rationally designed products made by genetically engineered microbes ("unnatural" NPs) that are carefully designed to enable facile, safe and inexpensive chemistries. As proof-of-concept of this innovative technology, we are applying this approach to a particular NP parasiticide currently used in pets, to dramatically reduce the cost of manufacturing of this valuable animal medicine and make it affordable to farmers for use in food animals. Once proven, this manufacturing innovation will revolutionize biotechnology and enable us to produce lower cost NPs, which can then be developed into excellent human pharmaceuticals, crop protection- and animal health- products.

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| **Pragmatic Printing Ltd** | NEMATODE | £97,094 | £67,966 |
| **Project description - provided by applicants** | | | |
| Flexible ICs (FlexICs) introduce intelligence and interactivity in form-factors that don't currently exist in the marketplace. Existing applications targeted by PragmatIC include electronics in packaging, high-frequency RFID and near-field communications (NFC), and temperature sensors. Each of these sectors represents a multi-billion dollar global opportunity, with FlexICs accounting for 30-40% of the value. The enhanced functionality enabled by the project enables even larger market opportunities to be addressed.<br><br>The objective of this project is to produce an amorphous oxide NMOS circuit on a flexible substrate incorporating a 1-byte (8 bit) Write-Once-Read-Many non-volatile memory based on Phase Change Materials (PCM). PCM have been successfully implemented in recordable CD and DVD technologies, and this project will adapt the technology for flexible electronics. Applications include traceability of pharmaceuticals through intelligent packaging, smart logistics and product authentication (to protect against counterfeit goods).<br><br>The project further supports regional development of electronics manufacturing in North-East England, building on many decades of activity in this field. | | | |

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| **Matrix Recycling Systems Ltd** | A new method for separation & full recovery of multilayered packaging waste to create high value materials | £99,779 | £69,859 |
| **Project description - provided by applicants** | | | |
| The food manufacturing sector has been producing multi-layered packaging since the 1970s. Multi-layered packaging offers a combination of properties that one polymer alone cannot provide (e.g. moisture, oxygen, light barrier, stiffness, clarity, gloss etc); typically comprised of layers of PET/PP/PE/PA. Over 40m tonnes p.a. of multilayered plastics are produced globally, of which the EU contributes 9.6m tonnes, with an expected growth of ~7%. However, due to the extreme difficulties in achieving effective separation of the multi-layered packaging into its constituent solid polymer components, there are no current technologies or operational processing plants for solid separation & recovery of the polymer fractions. As a consequence, multi-layered, flexible plastic waste is currently collected as a single waste stream & disposed of through landfill (at costs of £100/t), or incinerated (~£60/t); generating global economic losses of £2.4-4 billion. Disposal of such large volumes of plastic also generates great environmental concern, with an urgent need to develop effective separation technology. Our objective is to develop a novel recycling method to separate multilayered plastic packaging waste. Successful development of this technology will create the business opportunity to recycle this material, generating new revenues while reducing waste, landfill, energy & reducing annual CO2 emissions. Our novel process will not only ensure the sustainable supply of these plastics as raw materials via recycling but will also provide participating SMEs with the opportunity to derive an ongoing income. | | | |

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|---|---|---|---|
| **Diamond Photofoil Ltd** | Photofoil universal transfer material technology | £99,676 | £69,773 |
| **Project description - provided by applicants** | | | |
| Environmentally friendly coating, labelling and application system for multiple applications. | | | |

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|---|---|---|---|
| **Unmade Ltd** | Unmade Knitwear Platform | £99,793 | £69,856 |
| **Project description - provided by applicants** | | | |
| *Need: Long lead times force brands and knitwear manufacturers to predict trends many months in advance, resulting in 10% of garments remaining unsold and being landfilled. As fashion trends accelerate, brands are ordering smaller volumes, making UK manufacture unprofitable as knitwear development is expensive and slow. Knit programmers currently manually translate designs into machine code, a highly skilled role in short supply, limiting UK knitwear production. *Solution: Unmade is an online knitwear customization and knitting machine management platform. Unmade allows: 1) Automated machine code production from knitwear designs, for accelerated knitwear development. 2) Brands to offer unique, tailored garments at an accessible price point, increasing ecommerce traffic and diversifying product offerings. 3) Zero stock production operations, significantly reducing costs. 4) Re-shoring of knitwear production, benefitting UK supply chains. *Approach: Unmade must develop: 1) Automated knitting machine code creation software to support whole-garment production. 2) Dynamic yarn tension model which accounts for yarn type, knitting structure and pattern to ensure correct fit, texture, stretchiness and longevity. 3) Efficient and dynamic knitting machine management software. 4) Fit and size customisation platform that also analyses machine availability and stock to adjust delivery estimates and pricing. *Impact: Project will allow Unmade to support automated whole garment knitwear production and prove efficacy to brand partners, increasing competiveness & growth. | | | |

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| **Tecman Speciality Materials Ltd** | DAAT Applications Development (Automotive Composites and Alloy Jointing) Project | £99,856 | £69,899 |

**Project description - provided by applicants**

Lightweight vehicles can help to reduce carbon dioxide emissions. With carbon fibre reinforced plastics (CFRPs) becoming cheaper, their wider uptake in automotive engineering is being limited by the curing time and costs associated with jigs and fixture costs for bonding CFRP panels. Tecman Speciality Materials (TSM) have developed a product (DAAT®) to replace liquid adhesives for CFRP panel bonding. DAAT® testing has revealed its bonding strength is greater than anticipated - meaning it's suitable for metal-metal bonding applications.

This project will firstly conduct a phase of desk-based research with key customers to understand which metal-metal applications are most desired for DAAT®. TSM will complete computer modelling of DAAT® applied to key subcomponents identified from the desk-based research, & will then manufacture prototypes of these components bonded with DAAT® to verify & validate the computer model predictions.

TSM will benefit from first mover advantage with this game changing technology. TSM anticipate sales of DAAT® to new & existing customers, with increases in revenue, staff and manufacturing capacity as a result of this project.

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| **Luxus Ltd** | A new concept process for removal of odour from post consumer waste polymer - VOCex | £99,585 | £59,751 |

**Project description - provided by applicants**

Although much progress has been made in recycling the easier polymer streams such as at-line production waste, or through specialist closed loop systems, the challenge to recycle Post Consumer polymer waste (mainly packaging from consumer goods such as food, sauces and detergents) is still tough, particularly for polypropylene and polyethylene. These polymers strongly absorb odours from their contents, which currently needs uneconomic levels of cleaning before they can be recycled into high value products such as automotive fascias and building products. Of the UK's 260,000 tonnes of post consumer polypropylene waste, under 1% is recycled into high quality products; the rest is used in low value applications such as buried geotextiles, or is landfilled or incinerated. The VOCex process concept from Luxus, a recycling compounder for automotive plastics, has been specifically created to provide a cost effective method to deodourise polymers for higher value uses. This proof of concept project is intended to validate the feasibility of the process and its ability to cope with the variability in the type and levels of odour compounds that occur in post-consumer polymer, to underpin our future objectives of scaling it up to commercial application. The future embodiment of the technology is envisaged as a turnkey or retrofit option for Luxus and other existing compounders as licencees, allowing them to provide high quality polymers from materials that would otherwise have been destined for landfill or incineration.

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| **Composites Evolution Ltd**<br>K. S. Composites Ltd | Low-cost Hybrid Tooling Materials for Increased Uptake of Carbon Fibre Components - HyTool | £99,185 | £67,235 |

**Project description - provided by applicants**

Mould tools used to produce carbon fibre parts must generally be made from carbon fibre or Invar due to the need to match the very low coefficient of thermal expansion (CTE) of carbon. These materials are expensive and have high embodied CO2, especially when considering that the moulds are often only used a few times to produce limited runs or even one-off parts before being scrapped. This limits the use of carbon fibre to high-end applications, restricts profitability and has a high impact on the environment.

Flax natural fibre has a low CTE, similar to carbon, but has significantly lower cost and environmental impact, and it has been shown to work well with carbon in a hybrid lay-up. Therefore flax could potentially be used to replace some (or all) of the carbon fibre in composite moulds, thereby reducing costs and environmental impact. However, significant work is required to develop the materials and prove their suitability for use in composite moulds.

The HyTool project will develop flax and hybrid flax-carbon tooling materials to reduce the cost and environmental impact of carbon fibre composite moulds. Reducing the cost of tooling will increase the profitability and competitiveness of the project partners and the wider UK composites supply chain, and will open up new applications for carbon fibre parts, generating additional revenue and jobs.

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| **Dycotec Materials Ltd**<br>European Thermodynamics Ltd | TRIuMPHANT: TheRmal Interface Material based on Phase Cahange MAterials for Heat mANagemenT | £99,810 | £69,867 |
| **Project description - provided by applicants** | | | |
| Electronic technology is continuously advancing and increasingly impacting on all areas of life and business through the use of products (such as mobile phones, lap-tops, tablets, and LED lighting) where there is an increasing need for higher power and more compact electronics. As a result, overheating is becoming a critical issue limiting further miniaturisation, power, performance & reliability. Thermal management to reduce heat build-up and minimise thermal damage is a critical need for a range of customers such as large electronic OEMs including: Intel, Apple, HP, Sony, Siemens, Sharp, Panasonic, Cisco and LG. These OEMs are actively searching for Thermal Interface Materials (TIMs) that can be applied to their market offerings. Due to the tight cost constraints within this industry, it is important that any solution can be applied quickly and cost-effectively preferably using existing equipment. The TRIuMPHANT project Approach and Innovation is to develop a Phase Change Thermal Interface Material that can achieve thermal conductivity >7W/m.K, twice that currently achievable, that can be cost-effectively applied using conventional deposition techniques. Exploitation of the technology through our existing global network of distributors will result in significantly increased revenues and profits, making our consortium partners more competitive globally. Manufacture in the UK (Swindon and Leicestershire) will also give us greater control of the supply chain and quality, allowing us to achieve long-term competitiveness. | | | |

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| **DZP Technologies Ltd**<br>LVH Coatings Ltd<br>University of Warwick | Scalable electrophoretic manufacture of high density 2-dimensional materials for energy storage applications | £99,891 | £78,867 |
| **Project description - provided by applicants** | | | |
| This is a collaborative project between two industrial partners, DZP Technologies Ltd and LVH Coatings Ltd, and one academic partner, the University of Warwick. The project will investigate the feasibility of using electrophoretic deposition to manufacture electrochemical energy storage of improved performance and new form factors. Additionally, our technology will make use of new, graphene-related materials which have the potential to produce a transformational step change in the performance of electro-chemical power devices. In this way, the project is involved with innovation in both manufacturing technology, and materials development.<br>The new and improved power devices enabled by our technology can be used across different power sectors, including the national grid, distributed power networks and low-carbon vehicles, in addition to the constantly evolving consumer electronics sector. Further to energy storage applications, EPD manufacturing itself can produce novel 2D material coatings with anti-corrosion and self-lubricating properties for the automotive, aerospace, and advanced surface engineering sectors. | | | |

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| **Oxford Lasers Ltd** | High speed precision drilling of micro holes with active size control | £98,486 | £68,940 |
| **Project description - provided by applicants** | | | |
| Laser micromachining is a rapidly growing field due to the accuracy, speed and enviromental benefits it brings. The project is to develop methods of laser drilling highly reproducible micro-holes at high speed for a wide range of applications in healthcare, transport and power generation. It is expected that the techniques developed will significantly reduce production costs while improving reproducibility and quality control. | | | |

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| **Ultrawise Innovation Ltd**<br>Far-UK Ltd<br>Tribus-D Ltd<br>ChemAgain Ltd<br>University of Hertfordshire | Rapid polymer to metal joints: RapidPM | £133,970 | £98,617 |

**Project description - provided by applicants**

Legislation is driving major changes in the way that certain industries designs and manufactures its products to make them more environmentally friendly and less polluting. In automotive, emissions controls are challenging designers to produce ever lighter vehicles, which has driven them to consider incorporating less dense materials such as polymer composites. In electronics, WEEE Legislation has driven designers to use materials, which are inherently recyclable as well as allowing them design freedom to reduce costs and increase functionality. This has led to a shift towards 3D packaging and the use of thermoplastic encapsulants.
RapidPM will develop technology to enable structures comprising fundamentally different material types to be assembled rapidly, consistently and using low cost technology. The basic approach is to use a thermoplastic coating which is deposited onto the surface of one component, usually a metal such as aluminium alloy or copper, and bond this by welding onto the other component which could typically be a thermoplastic or a thermoplastic composite. In this way, designers of structures for the electronics and automotive industries can use the flexibility afforded by advanced thermoplastic processing technologies, the properties of the thermoplastic in use, and the inherent recyclability which thermoplastics bring by remelting. The project will generate results of mechanical test of joints, environmental tests, and techno-economic assessment against conventional adhesive bonding and mechanical fastening techniques.

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Innovate UK

## Results of Competition: Materials and Manufacturing up to 12 Month Projects
## Competition Code: 1605_SC_MM_R1

### Total available funding for this competition is £5M from Innovate UK

**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 |
|---|---|---|---|
| **Sismatico (UK) Ltd** | FastIonRinse- Sustainable, container cleaning technology, surpassing manufacturers' standards | £99,907 | £69,934 |

**Project description - provided by applicants**

Sismatico are one of only a few companies globally who provide reliable, high-throughput (160,000 cans-per-hour [CPH]) can filling lines to large drinks factories. Such high througphut machinery is a small, high value market. Ensuring cleanliness of cans is critical, so lines incorporate a rinsing stage. Beverage manufacturers use several methods to measure how effective cleaning is. Existing can rinsers use water, which allows high speed and cleaning performance, but uses large amounts of water, ruling out water rinsers in water-stressed regions and adding to running costs elsewhere. Ionised air rinsers are an alternative technology that eliminates water use. We incorporate these using components from several manufacturers, such as Meech and Estat. However, neither ourselves nor our competitors have achieved 90,000cph singe line throughput in combination with cleanliness test performance, against Pepsico's target of 160,000cph. We have demonstrated that a hybrid water/air rinser exceeds cleanliness and throughput specifications, but does not meet a major customer's (Pepsico) criteria for reducing water use.
This project will trial several approaches to use novel, rotating ionised air nozzles in a can rinser that:Exceeds specifications in contaminant removal; Reduces rinsing water use to zero; Fits into footprint (1×1.6m) of exisiting can filling lines; Delivers 160,000 cph throughput, alongside 100% reliability (no unplanned stoppages) and 24/7 operation. We have identified potential sales 0f £20m; £3m from Pepsico alone post-project.

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Innovate UK

## Results of Competition: Materials and Manufacturing up to 12 Month Projects
## Competition Code: 1605_SC_MM_R1

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Aburnet Ltd**<br>Trimlace Ltd<br>Nottingham Trent University | TekChef | £366,898 | £276,910 |
| **Project description - provided by applicants** | | | |
| It is considered good practice and strongly recommended by the Foods Standards Agency for food service staff to wear hats or hair covering to prevent the contamination of food by hair; additionally, hair and the scalp can also be a source of microbial contamination particularly when operators unthinkingly scratch their heads or touch their hair without washing their hands. Hats in foodservice also serve other functions including denoting a person's status and promoting a corporate image.<br>Hats or caps are not worn in all food preparation establishments for a variety of reasons and it is our proposal to prove our concept of TekChef a light, cool and cheap technical headwear the manufacture of which can be automated as a continuous process and decorated with customisable digitally printed images to provide branded and promotional messages. TekChef hats will also feature our proprietary HairBarrier and StayCool technology and the hats will have anti-microbial treatments. The resulting lightweight caps will be lower cost in use, attractive to wear and be more comfortable than existing textile, paper and non-woven caps and the promotional messages they carry will provide a commercial impetus to encouraging their use and thereby improve hygiene and food quality. | | | |

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Innovate UK

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## Competition Code: 1605_SC_MM_R1

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Sexton Materials Research Ltd**<br>TATA Steel UK Ltd<br>e2v Technologies (UK) Ltd<br>Darlow Lloyd & Sons Ltd<br>University of Nottingham<br>Swansea University | Ferrous By-product Recycling Using Microwave Technology (FERMAT) | £364,234 | £224,695 |
| **Project description - provided by applicants** | | | |
| The project aims to use microwave technology in new ground breaking processes to transform unuseable ferrous process by products into a high value raw material that can be re-used in the steel making process, thus creating value for the partners, improving resource resilience, reducing environmental impact and increasing business sustainability. It is envisaged that a successful outcome will have significant economic impact across a broad range of industrial sectors as the technology gains acceptance. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Oxford Biotrans Ltd** | Innovation in metalloenzyme E.coli fermentation | £93,631 | £65,540 |
| **Project description - provided by applicants** | | | |
| The compounds used in the flavour and fragrance (F&F) and agrochemical (such as pesticides) industry today are produced through two main routes. Either through extraction from plant material, much of which is endangered or at very low concentrations, but produces natural compounds, or using synthetic means - multi-step traditional chemistry that typically produces high levels of waste and environmental impact (such as strong acids, heavy metals, high temperatures / energy usage and petrochemical-based feedstock).<br>There is a high level of consumer-led demand for natural, or 'green', environmentally friendly F&F, fine-chemical and agrochemical components, which significantly outstrips the ability of natural sources and indeed conventional synthetic routes to sustainably provide. Oxford Biotrans (OB) is leading the way in creating industrial biotechnology routes to meet these needs. Through the use of enzyme biocatalysts, derived from fermentation (like brewing), the production of these high value chemicals can be achieved, in a green, sustainable manner. However, the state-of-the-art in fermentation methods to produce these complex metalloenzymes restricts the implementation of this technology to very highly priced compounds.<br>This project aims to innovate OB's current commercial fermentation process, increasing the yield and activity of the enzymes produced to drive down the cost of production. This is turn will enable the technology to be rolled out across many industries, to meet a host of compounds at economic scale. | | | |

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Innovate UK

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Fiberight Ltd**<br>Knauf Insulation Ltd | Commercialisation of MSW derived sugars for the production of thermoset resins | £302,921 | £193,391 |
| **Project description - provided by applicants** | | | |
| Fiberight Ltd and Knauf Insulation will work together to demonstrate the use of sugars produced from residual waste in the manufacture of thermoset resins. Fiberight has created a circular economy solution to generate value-added products from residual waste, by thermo-mechanically treating and washing the waste and then treating the recovered cellulose with enzymes to generate sugars, recyclable materials and biomethane. Knauf will use these sugars to test a range of thermoset resin products, including resins suitable for adhesion of insulation products. The project will undertake a series of production trials and laboratory testing to evaluate and demonstrate the replacement of food grade sugar with waste derived sugars both technically and commercially across a range of thermoset resin applications. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **TISICS Ltd** | Digital Automation and Optimisation of Silicon Carbide Monofilament Production | £99,554 | £69,688 |
| **Project description - provided by applicants** | | | |
| As part of a UK collaborative project TISICS have developed and now produce a higher performance silicon carbide monofilament for the reinforcement of metal matrix composites and one which has the potential to be manufactured at lower cost. This high strength, lightweight material is of great importance in the space and aerospace sectors as well as having applications in other industries.<br><br>This project will take advantage of recent developments in digital automation to significantly improve the effeciency and productivity of the monofilament production. The benefits of the project outputs i.e. improved process control and cost effectiveness will be an enable for material qualification and uptake within the space and aerospace sectores.This will allow TISICS to compete on the world stage by becoming the only large-scale supplier of this class of material outside the US. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Aquasium Technology Ltd**<br>TWI Ltd | Enabling high productivity cost effective welding for the power sector (HiWeld) | £99,639 | £71,945 |
| **Project description - provided by applicants** | | | |
| The demand for 'thick section' steel structures in power generation is strong & growing – primarily driven by need for off-shore wind towers and foundations structures – with UK demand for 1,000 structures or 1m tonnes of steel p.a. The fabrication of structures is limited by the welding time (and cost); to produce a typical 40m long monopile (60mm thick) takes ~6,000 hrs. CVE has developed the 'EbFlow' system which reduces this welding time to <200 hrs, equivalent to a reduction in cost of over 85%.<br>However, to date, this has only been successfully achieved using proprietary 'HTUFF'™ steel supplied by the Nippon steel from Japan. This steel alloy is able to overcome HAZ toughness which is by product of the rapid welding approach. Owing to Nippon having a monopoly supply position, this has prevented and serious market investment and uptake of the approach.<br>The HiWeld project aims to integrate induction heating into the EbFlow system, to overcome this issue by applying a localised heat-treatment – allowing standard grades of C-Mn steel to be used for structures. Critically, standard S355 steel can be supplied by any UK, European or Worldwide supplier; unlocking a key market barrier to adoption of the EbFlow process. This development will enable >£10m of systems to be deployed by CVE within 3-5 years of project completion, potentially reducing the cost of off-shore wind structures by 3-5% (LCOE prediction). | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Tribus-D Ltd** | Miniaturisation of intelligent power modules through advanced electronic packaging techniques | £49,792 | £34,854 |
| **Project description - provided by applicants** | | | |
| There is a growing need to generate, convert and distribute electric power from the source to the load, which is fulfilled through the use of power electronics. Packaging and assembly of the power electronics modules is important in determining the efficiency, size, weight and manufacturing costs. This project will seek to establish manufacturing methods to maximise thermal dissipation and minimise circuit parasitics through advanced interconnection techniques and create a UK based supply chain for the manufacture of customised smart power modules. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Pera Technology Solutions Ltd** | Continuous microwave activation of carbon black | £94,654 | £56,792 |
| **Project description - provided by applicants** | | | |
| Our project concerns the innovative manufacturing of activated carbon (AC) using a novel, continuous microwave (MW) technology. AC is commonly made by the activation of carbon black produced from a range of raw materials, including coconut shells, coal and municipal solid waste. These starting materials are heated to high temperatures in an inert atmosphere in a process known as pyrolysis to generate carbon black, pyrolysis oils and non-condensable vapour. The carbon is recovered and then converted into AC using a second thermal process with the addition of steam or dehydrating chemicals. This step dramatically increases the surface area of the carbon, making it a useful material in a diverse range of end uses including water purification, gas adsorption and filtration.<br><br>Proving the concept of using high-efficiency MW power and continuous throughput for AC manufacture will lead to a breakthrough innovation in the cost-effective and competitive production of AC from waste materials.The technology would be suitable for the processing of carbon-rich waste from multiple sectors and would generate a valuable product for applications also across multiple sectors. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Perlemax Ltd**<br>Cambridge Nanolitic Ltd<br>University of Manchester | Durable plasma reactor electrodes with nanoceramic coating | £225,755 | £110,795 |
| **Project description - provided by applicants** | | | |
| Plasma processing is widespread for high performance materials, but has increasing applications for chemical products and intermediates. For the most common type of plasma reactor -- the dielectric barrier discharge -- to be durable for the continuous production of chemicals over a long lifetime, the dielectric coating must be robust in material selection, but also is subject to tight tolerance restrictions on the uniformity and thickness of the coating, particularly for multiplexed microreactors. Very few of an array of such microreactors will "fire" unless these tolerances are met. This proposal is to explore the application of a novel coating with appropriate materials to achieve the necessary level of tolerance and durability, and will test the plasma microreactor fidelity and performance on an exemplar application to produce ozone-rich microbubbles for cleaning, sterilisation, and gas transfer purposes, in the first instance, related to "green" laundry machines. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **It's Fresh Ltd** | Extending longevity of cut flowers using our innovative ethylene scavenging technology | £99,977 | £69,983 |

**Project description - provided by applicants**

The UK demand for fresh cut flowers is rising steadily each year, with the market currently worth £2.5 billion p.a. Maintaining low temperatures is crucial for restricting the respiration rate of the cut flowers and consequently reducing premature death. However, upon their arrival to retailers, the flowers are allowed to warm to ambient temperature. This quickly increases the respiration rate, reducing flower shelf & vase life. In addition, as cut flowers are placed in water upon arrival at the retailers, life span is further reduced as bacteria harboured in flower water can cause premature death through a number of mechanisms; bacterial presence also represents a health & safety issue for fruits & vegetables kept nearby. Another key factor crucial to the longevity of the bouquet is ethylene; which can have a number of undesirable effects on cut flowers such as flower/petal drop, leaf yellowing & premature death.

Our objective is to develop our novel active packaging film for the floral industry which will extend the longevity of cut flowers throughout the supply chain. It is envisaged that our new delivery system will:

• Extend life of cut flowers 'at store & home' by 100%, from 5 to 10 days (shared by consumer & retailer)
• Reduce pre-sale flower waste from retailers & wholesalers by 50% (from 10% to 5% of throughput)
• Increase customer satisfaction due to the longer life 'in home' of purchased bouquets

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Johnson Matthey PLC**<br>Promethean Particles Ltd<br>Queen Mary University of London | Development of a novel multifunctional bioglass-based coating for the next generation of prostheses | £741,085 | £507,029 |
| **Project description - provided by applicants** | | | |
| With an ever ageing population, there are an increasing number of patients requiring medical devices, such as artificial joints and dental implants to enable everyday activity. An improvement of current implants will offer tremendous benefits. In particular, there is an urgent need for technologies to improve the fixation of implants/devices in bone without infection occurring. These will contain doped nano-sized bioactive glass to enable strong integration with bone and anti-microbial properties. The proposed project has 4 key deliverables: 1- Synthesis of novel nano-materials by state of the art manufacturing processes; 2- Development of optimum formulations with these novel materials; 3 Selection of optimum coating technique for application onto implant substrates and 4- Biological testing of coated implant prototypes. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **NeuDrive Ltd** | Efficient and Environmentally Benign Manufacturing Routes to Novel Fluoropolymer Material Formulations | £71,605 | £50,123 |
| **Project description - provided by applicants** | | | |
| This project aims to develop novel polymeric materials and formulation manufacturing processes for use in organic thin film transistor (OTFT) devices. Such devices are expected to be incorporated in the next generation of flexible and conformable products, finding application in the fields of consumer electronics, wearables and medical devices. Specifically, the project proposes the development of novel purification processes for OTFT device component materials that are currently being developed by NeuDrive. These processes will result in formulations having lower cost of manufacture, improved manufacturability, higher performance and reduced environmental impact. The project will also seek to explore potential applications for the novel materials, outside of the OTFT sector. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Green Lizard Technologies Ltd** | Process optimisation of 2,3-epoxy-1-propanol for downstream speciality chemical production. | £79,100 | £55,370 |
| **Project description - provided by applicants** | | | |
| In response to climate change targets and mandates for increasing the use of biodiesel in transportation fuel, there has been a significant rise in production of glycerol, which is the main by-product of biodiesel manufacture. Due to this, there is an increased interest in the production of value-added chemicals from glycerol. This project will demonstrate, at mini pilot scale, how glycerol can be transformed into a higher-value chemical feedstocks, namely 2,3-Epoxy-1-propanol (EP), through novel greener processes than are currently employed industrially. Our new greener process offers a breakthrough technology compared with current industrial routes, removing the necessity for harsh and toxic chemicals and synthesising the product from a renewable feedstock. EP can be exploited in various ways including, as a precursor for polymer production, as a stabiliser for natural oils, a gelation agent in solid propellants, in surface coatings, pharmaceuticals , CO2 capture solvents, new polymers and as feedstocks for other chemical intermediates. More importantly they are of significant value. By providing a high-value exploitation path for glycerol this project will underpin the economic sustainability of biodiesel in the UK from its biodiesel activities using a variety of vegetable oils and fats. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Specialty Scanners Ltd** | Bulk HighTemperature Superconducting Magnet Pole for new generation Magnetic Resonance Scanners | £99,741 | £69,819 |

**Project description - provided by applicants**

There is consensus that magnetic resonance (MR) scanner technologies are the tool of choice when it comes to early detection of many diseases and disorders. However, today's conventional MR scanners are costly, heavy, large and also they can be difficult to site. Hence, currently, MR scanners are most often associated with big hospitals, which limit patient access to this important technology. This Pilot Project will deliver an innovative, key subsystem which could enable the design and construction of less costly, smaller, lighter MR scanners, yet, still capable of operating at higher magnetic fields and producing high resolution diagnostic quality images. This could mean that the MR scanners could be sited in GP practices and other small clinical settings for wider access by local communities obviating the need for the patients to travel to large hospitals in big cities. Since 'dementia' (an umbrella term used for many types of neurodegenerative diseases) and particularly Alzheimer's is currently not well understood, there is consensus that the research should concentrate on detecting very early signs of degeneration. It is believed that brain cell death leading to dementia may start decades earlier before memory problems become noticeable. By that stage, a fifth of the core memory centres of the brain might have already be dead. Hence, an argument could easily be made for the introduction of a 'local, GP screening programme' for dementia starting at a relatively young age using MR imaging (MRI) as a primary screening modality. Potentially, this pilot project could help to the realisation of that important goal.

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|---|---|---|---|
| **Camscience Ltd** | REMAN-ETN (EQUIVALENT TO NEW) | £35,514 | £24,859 |
| **Project description - provided by applicants** | | | |
| The project involves the industrial development of a novel cleaning process and materials for the remanufacturing of products with complex internal geometries. The technology applies a combination of energy sources to deconstitute contamination in a product, to restore the product's critical surfaces to a condition equivalent to new, or better than new condition. Products suitable to be treated with this process include industrial printheads (value £1,500 - £6,000) used in large printing presses with hundreds of printheads , consumer inkjet cartridges, consumer and business desktop printers and automotive diesel particulate filters. The process so developed will be environmentally green, with minimal waste materials produced. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Zigoorat Ltd** | Design, build and testing of a novel high-temperature SiC capacitive pressure sensor technology for applications with extreme environment | £98,503 | £68,952 |
| **Project description - provided by applicants** | | | |
| There is a rapid trend to stable, high temperature materials for solid-state sensors and electronics in today's automotive industry to monitor and control the vehicles performance, as well as to enhance fuel efficiency, reduce emissions and improve reliability of future vehicles. Silicon carbide (SiC), a wide band gap semiconductor with superior mechanical strength, chemical inertness and high thermal conductivity, is suitable for automotive applications where stable performance at harsh environment is critical. The main limitations of conventional Si-based pressure sensors for applications in extreme environment are: limited temperature and radiation tolerance, limited corrosion and erosion resistance, and poor mechanical strength against chemicals, vibration and high temperature (> 200oC).<br>The project aims to study, assess and quantify the technical and commercial feasibility of a newly developed Silicon Carbide (SiC) thin film pressure sensor technology for harsh environment applications which can potentially lead to 70% reduction in sensor manufacturing costs when compared to widely available Silicon-based sensors, through a novel fabrication and manufacturing process, while its stability and mechanical properties are substantially improved. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Solar Capture Technologies Ltd** | Manufacturing innovation for small bespoke solar modules using the next generation of silicon solar cells | £66,767 | £39,053 |
| **Project description - provided by applicants** | | | |
| An assessment of the suitability of the new generation of crystalline silicon solar photovoltaic cells for their use in small custom made solar modules. | | | |

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| Participant organisation names | Project title | Proposed project costs | Proposed project grant |
|---|---|---|---|
| **Watts Urethane Products Ltd** | Materials Innovation Nanotechnologies Experimentation (MINE) | £99,785 | £59,871 |

**Project description - provided by applicants**

Downtime from reactive and scheduled interventions associated with key production steps in the vital UK quarrying and aggregate recycling industries costs up to £1.2bn/yr in lost productivity. The effects of premature wear and blockages in hopper-fed systems for mechanical screening accounts for up to 5% of total operational costs, due to the harshness of the operational environment and abrasive, irregular nature of mineral resources and recyclate.
Watts Urethane Products are the UK's second largest manufacturer of PU components and assemblies, and already have a presence in the quarrying and mining industry. Now they seek to establish the feasibility of an end-to-end material/design platform for extreme applications, through a novel manufacturing process to functionalise PU with high-performance nanomaterials (nPU). With potential for step change in control and performance of key part parameters, R&D initiates a framework to match PU and nanocomposition to user needs. The potential for unprecedented nPU customisation enables optimised wear life, function and cost-effectiveness, also targeting new insight for digital modelling to redefine the design of critical assemblies and operations in these demanding environments.

**Note: you can see all Innovate UK-funded projects here**
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