M-ERA.NET Call 2019
List of projects recommended for funding

Call topics	Acronym	Full Title	No. of Partner	Participants	Funding organisations
Inovative surfaces, coatings and interfaces	**AnBaCo**	Antibacterial Coatings Containing Carbon Nanoparticles Obtained by Sol-Gel Method	3	Lodz University of Technology (Poland); Technical University of Liberec (Czech Republic); TERMEX (Poland)	NCBR (Poland); TACR (Czech Republic);
Inovative surfaces, coatings and interfaces	**cladHEA+**	Laser cladding as resource efficient manufacturing route for high temperature corrosion and wear resistant coatings based on High Entropy Alloys (HEA)	4	Fraunhofer Institute for Material and Beam Technology IWS (Germany); CEA - French Alternative Energies and Atomic Energy Commission (France); ICMPE - Institut de Chimie et des Materiaux Paris-Est (CNRS) (France); Nizhny Tagil Machine-Building Plant (NTMP) (Russia)	SMWK (Germany); ANR (France); FASIE (Russia)
Inovative surfaces, coatings and interfaces	**ENZ4IFACES**	Innovative enzymatic coatings for electrochemical interfaces	4	International Centre of Biodynamics (Romania); Institute of Biology (Romania); Metrohm-DS S.L (Spain); Rhodes University (South Africa)	UEFISCDI (Romania); IDEPA (Spain); DST (South Africa)
Inovative surfaces, coatings and interfaces	**interBATT**	Key enabling interface engineering and characterization for next generation batteries	5	German Aerospace Center - DLR (Germany); Luxembourg Institute of Science and Technology (Luxembourg); Natural and Medical Sciences Institute (Germany); AIXTRON SE (Germany); Custom Cells Itzehoe GmbH (Germany)	PtJ (Germany); FNR (Luxembourg)
Inovative surfaces, coatings and interfaces	**IsoWire**	Drug eluting coating with ultra-low friction interface for urological guide wire to reduce trauma during surgical removal of renal stones.	3	Warsaw University of Technology (Poland); WISMED PL (Poland); University of Cape Town (South Africa);	NCBR (Poland); DST (South Africa)

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Inovative surfaces, coatings and interfaces	**LaMoFlo**	High-rate laser surface texturing of 3D injection molds to fabricate functionalized easy-flow polymeric containers	3	HS Mittweida (Germany); McGill University Montreal (Canada); École de Technologie Supérieur Montreal (Canada); IPL Inc. (Canada); Moulexpert Inc. (Canada)	SMWK (Germany); Prima (Canada)
Inovative surfaces, coatings and interfaces	**MiDICoat**	Microstructure Design of Innovative Interfaces in CVD Hard Coatings	3	Bergakademie Freiberg, Institute of Materials Science (Germany); Fraunhofer Institute for Ceramic Technologies and Systems (Germany); Dormer Pramet s.r.o.(Czech Republic)	SMWK (Germany); TACR (Czech Republic)
Inovative surfaces, coatings and interfaces	**MiLaCo**	New optical Components based on nanostructured dielectric thin films designs for application in MicroLasers	6	FTMC (Lithuania); Aix Marseille University / Fresnel Institute (France); UPC (Spain); : Integrated Optics (Lithuania); Optogama (Lithuania); Monocrom (Spain)	RCL (Lithuania); ANR (France);
Inovative surfaces, coatings and interfaces	**OxyGaN**	Efficiency enhancement in GaN-based blue to blue-violet LDs by engineered nitride-oxide ohmic contacts	5	Sieć Badawcza Łukasiewicz - Instytut Technologii Elektronowej (Poland); Institute of High Pressure Physics, Polish Academy of Sciences (Poland); Institute for Technical Physics and Materials Science, Centre for Energy Research (Hungary); Israel Institute of Technology (Israel); TopGaN Lasers inc (Poland)	NCBR (Poland); NKFIH (Hungary); MOST (Israel)
Inovative surfaces, coatings and interfaces	**SensCoat**	Smart Nano-bio-coating for Manufacturing of Biosensors for Point of Care Molecular Genetic Diagnosis	4	Solar Biyoteknoloji İlaç Kimya Gıda San.Tic. Ltd. Ş (Turkey); MicruX Fluidic, S.L. (Spain); Fraunhofer Institute for Electronic Nano Systems (Germany)	TUBITAK (Turkey); IDEPA (Spain); SMWK (Germany)
High performance composites	**AMCSS**	Additive manufactured composite smart structures with embedded fibre Bragg grating sensors	3	Institute of Fluid Flow Machinery, Polish Academy of Sciences (Poland); Kaunas University of Technology (Lithuania); Institute of Fundamental Technological Research of the Polish Academy of Sciences (Poland)	NCN (Poland); RCL (Lithuania)

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High performance composites	**HEMP4NZEB**	Manufacturing technology of building products made of ecological high performance fibre composites with encapsulated PCM for the NZEB application	4	Riga Technical University (Latvia); Warsaw University of Technology (Poland);"Hemp eco systems Latvia" Ltd. (Latvia); "Budynki z konopi" (eng. "Building with hemp", BH) (Poland)	VIAA (Latvia); NCBR (Poland)
High performance composites	**Hybrid_beams**	Composite reinforcement in a light stainless steel bus structure	4	VZÚ Plzeň (Czech Republic); Fatigue Analysis RI (Czech Republic); ZČU v Plzni (RTI) (Czech Republic); Solaris (Poland)	TAČR (Czech Republic); NCBR (Poland)
High performance composites	**MERF**	Matrix for carbon reinforced epoxy laminates with reduced flammability	5	SYNPO, akciová společnost (Czech Republic); Department of Physical Electronics, Masaryk University (Czech Republic); Kauno Technologijos Universitetas (Lithuania); Institute for Mechanics of Materials, University of Latvia (Latvia); Polymer Institute, Slovak Academy of Sciences (Slovak Republic)	TAČR (Czech Republic); RCL (Lithuania); VIAA (Latvia); SAS (Slovak Republic)
High performance composites	**NATALINA**	Natural fibers reinforced composite: an affordable and sustainable new material/ design/ manufacturing approach	3	LIST (Luxembourg); B-PREG (Turkey); KAREL KALIP (Turkey)	FNR (Luxembourg); TUBITAK (Turkey)
High performance composites	**NovCom**	Novel high performance diamond based composites	3	GeniCore Sp. z o.o (Poland); Fraunhofer IKTS (Germany); High Technology Machines Sp. z o.o. (Poland)	NCBR (Poland); SMWK (Germany)
Functional materials	**3D-Photocat**	Multifunctional 3D photocatalytic systems for environmentally friendly sustainable technologies	4	University of Alicante (Spain); Universidade Federal de SaoPaulo (Brazil); Transilvania University of Brasov (Romania); Epi System (Romania)	AEI (Spain); FAPESP (Brazil); UEFISCDI (Romania)

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Functional materials	**CENTAUR**	Ceramics with sensing capabilities for high temperature applications	3	Technical University of Chemnitz (Germany); Luxembourg Institute of Science and Technology (Luxembourg); Technical University of Liberec (Czech Republic)	SMWK (Germany); FNR (Luxembourg); TACR (Czech Republic)
Functional materials	**C-MOF.cell**	Novel materials as electrode and electrolyte components in fuel cell technology	4	Fundación IMDEA Energía (Spain); University of Tartu (Estonia); University of La Laguna (Spain); Institut Charles Gerhard Montpellier (France)	AEI (Spain); ETag (Estonia); ANR (France)
Functional materials	**COSMAG**	From the Cosmos to the Lab: Development of the L10-FeNi Phase as a Disruptive Permanent Magnet Alternative	4	IMDEA Nanociencia (Spain); Leibniz Institute for Solid State and Materials Research, IFW-Dresden (Germany); Institute of Physics, Slovak Academy of Sciences (Slovak Republic); IMA S.L.U. (Spain)	AEI (Spain); SMWK (Germany); SAS (Slovak Republic);
Functional materials	**GADEIRE**	Gas Absorption sensors Development for Environment based on novel mid-InfraRed hollow fibers with Enhanced functional design	4	University of Lille-CNRS (France); Wroclaw University of Science and Technology (Poland); MULTITEL (Belgium); LASERSPEC (Belgium)	ANR (France); NCN (Poland); SPW (Belgium)
Functional materials	**HYSUCAP**	Synthesis and characterization of novel 2D hybrid materials for supercapacitors	3	Technische Universität Dresden (Germany); Brno University of Technology (Czech Republic); University of Warsaw (Poland)	SMWK (Germany); TACR (Czech Republic); NCN (Poland)
Functional materials	**INNENERMAT**	Innovative nanostructured materials and smart textile electrodes for new generation of batteries and supercapacitors	6	CSIC-INCAR (Spain); DLR-Stuttgart (Germany); VARTA Microbattery (Germany); University Calabria (Italy); Centro Ricerche ASTREA (Italy); CNR-ITAE (Italy)	AEI (Spain); PtJ (Germany); Regione Callabria (Italy)

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Functional materials	**LiBASED**	Li-ion BAttery-SupErcapacitor Hybrid Device	3	Centre of Polymer Systems, Tomas Bata University in Zlín (Czech Republic); Polymer Institute, Slovak Academy of Sciences (Slovak Republic); Sabancı University Nanotechnology Research and Application Center (Turkey)	TACR (Czech Republic); SAS (Slovak Republic); TUBITAK (Turkey)
Functional materials	**NANOPOL**	Low density NANOnanocellular POLymers for thermal insulation in buildings. Basic heat transfer mechanisms and LCA	3	CellMat Technologies S.L. (Spain); National Taiwan University of Science and Technology (Taiwan); Universidade Estadual de Campinas (Brazil)	ICE (Spain); MOST (Taiwan); FAPESP (Brazil)
Functional materials	**NewILUMIS**	NEW VERSATILE PLATFORM FOR ILLUMINATION AND SENSING	5	Łukasiewicz Research Network - Institute of Electronic Materials Technology (Poland); Institute of Research for Ceramics (France); Warsaw University of Technology (Poland); Fraunhofer Institute for Ceramic Technologies and Systems IKTS (Germany); Teknosystem sp. z o.o. (Poland)	NCBR (Poland); ANR (France); SMWK (Germany);
Functional materials	**SALMOS**	Sensor Arrays using Luminescent Metal-Organic Frameworks for the Optical Detection of Explosive Vapours and Toxic Substances	5	Universidad Pablo de Olavide (Spain); University of Cyprus (Cyprus); Balıkesir University (Turkey); University of Amsterdam (The Netherlands); INDRA Sistemas S.A. (Spain)	AEI (Spain); CRIF (Cyprus); TUBITAK (Turkey)
Functional materials	**SmartMatter**	Core integration of novel functional, adaptive materials into a smart, highly sensitive analytical system for point of need environmental applications	5	International Centre of Biodynamics (Romania); CNR ITM (Italy); CNRS-IEM (France); CHIPLINK (Romania); Centro Analisi Biochimiche Sas (Italy)	UEFISCDI (Romania); REGIONE CALABRIA (Italy); ANR (France)

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Functional materials	**TRAVEL**	A Novel Transparent Electrodes for VCSELs	4	Technical University of Lodz (Poland); VIGO Systems S.A. (Poland); CNRS (France); Warsaw University of Technology (Poland)	NCBR (Poland); ANR (France)
New strategies for advanced material-based technologies in health applications	**Eco-OLED**	Enabling a Commercially Viable Long Lifespan and High-Efficiency Omni-Friendly OLED Lighting Source with G2 and G3 Emitters	4	National Tsing-Hua University (Taiwan); Kaunas University of Technology (Lithuania); Institute of Solid State Physics of University of Latvia (Latvia); Riga Technical University (Latvia)	MOST (Taiwan);RCL (Lithuania); VIAA (Latvia);
New strategies for advanced material-based technologies in health applications	**INJECT-BIO**	Bioactive injectable hydrogels for soft tissue regeneration after reconstructive maxillofacial surgeries	5	Riga Technical University (Latvia); State Research Institute Centre for Innovative Medicine (Lithuania); Marmara University (Turkey); Tomas Bata University in Zlin (Czech Republic); Technion-Israel Institute of Technology (Israel)	VIAA (Latvia); RCL (Lithuania); TÜBITAK (Turkey); TAČR (Czech Republic); MOST (Israel)
New strategies for advanced material-based technologies in health applications	**ISIDE**	Innovative Strategies for bIoactive/antibacterial advanceD prosthEses	6	Technological (Italy); Università della Calabria (Italy); Universität Leipzig (Germany); National Institute of Research and Development for Optoelectronics (Romania); University Politehnica of Bucharest (Romania); Muğgla Sıtkı Koçman University (Turkey)	REGIONE CALABRIA (Italy);SMWK (Germany); UEFISCDI (Romania); TÜBİTAK (Turkey)
New strategies for advanced material-based technologies in health applications	**LIGNP4WOUND**	Antibacterial breathable wound dressing based on polymer electrospun nanofibers	3	Brno University of Technology (Czech Republic); ING MEDICAL (Czech Republic); LIST (Luxembourg)	TAČR (Czech Republic); FNR (Luxembourg)

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Materials for additive manufacturing	**fingerIMPLANT**	Patient-specific, anti-microbial bioactive finger implants for durable functional reconstruction after amputation	6	JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria); ChM Sp. z.o.o. (Poland); Polish Academy of Sciences, Institute of Metallurgy and Material Sciences (Poland); Lithoz GmbH (Austria); Inocon Technologie GmbH (Austria); Medical University of Graz (Austria)	FFG (Austria); NCBR (Poland)
Materials for additive manufacturing	**MultiMat3**	Multi-Material Additive Manufacturing	6	Leibniz-Institut für Polymerforschung Dresden e.V. (Germany); University of Pretoria, Institute of Applied Materials (South Africa); Greenfield Innovation (Pty) Ltd (South Africa); ARBURG GmbH & Co. KG (Germany); Allod Werkstoff GmbH & Co. KG (Germany); Microfol Compounding GmbH & Co. KG (Germany)	SMWK (Germany); DST (South Africa)
Materials for additive manufacturing	**RIPE4TEC**	Reactive Inkjet Printing of Epoxy Thermoset Composites	5	Joanneum Research Forschungsgesellschaft m.b.H. (Austria); bto-epoxy GmbH (Austria); Montanuniversität Leoben (Austria); University POLITEHNICA of Bucharest (Romania); National Institute for Aerospace Research "Elie Carafoli“ (Romania)	FFG (Austria); UEFISCDI (Romania)
Materials for additive manufacturing	**SEAM-PP**	Material and process development for the production of large-sized polypropylene components in the novel high-speed 3D printing process SEAM	6	Fraunhofer IWU (Germany); metrom Mechatronische Maschinen GmbH (Germany); Kunststofftechnik Weißbach GmbH (Germany); Institut für Werkstofftechnik und Kunststoffverarbeitung (Switzerland); Jansen AG (Switzerland); Grütter Kunststoff + Formen AG (Switzerland)	SMWK (Germany); Innosuisse (Switzerland)

Publishable abstract of the projects (alphabethical order)

3D-Photocat

The main goal of 3D-Photocat is the development of highly extended 3D carbonaceous@TiO2 heterojunctions with improved photocatalytic performance for environmentally friendly reactions. High-surface area activated carbons modified with graphene (or graphene derivatives) will be used as 3D platforms to grow a thin TiO2 nanofilm so that the final composite will give rise to an optimal photocatalytic performance based on the Z-scheme heterojunction model. These composites will be designed to take advantage of the excellent photocatalytic performance of TiO2 and graphene, and the superior conversion of light in the confined nanospace of activated carbon materials. The development of a controlled porous network and a well-defined surface chemistry (including a well-dispersed TiO2 nanofilm) will provide a bifunctional system able to adsorb and convert simultaneously or in pulsed-mode i) CO2 into value-added chemicals, and ii) water pollutants into harmless compounds.

AMCSS

The project specific innovation objectives and results are related to the development of high performance composites – additive manufactured (AM) carbon/ glass fibre reinforced polymers (CFRP/ GFRP) with embedded fibre Bragg grating (FBG) sensors. FBG sensors advantages (small dimensions and weight, high multiplexing capabilities) allow to embed them into structures without influence on the material durability. It allows development of structural health monitoring (SHM) system increasing the safety of AM structures recently very popular in many industrial branches. Impact and potential benefits are related to developing method of manufacturing high strength performance composite materials with embedded FBG sensors. Such approach combines in one advantages of AM (limited waste, elements with complex shape) and SHM system (safety, information about real loading conditions). Such method can be applied for manufacturing of different elements in e.g. marine, civil engineering structures.

AnBaCo

The aim of the project is to obtain, by sol-gel method, nanocarbon-containing coatings with high antibacterial properties and low toxicity, for various applications. Particularly, in the first step of the project, known technology of sol-gel layers deposition will be further developed in order to substitute toxic metal compounds with non-toxic carbon nanoparticles (CNPs). This will result in elaborated technology of coating with modified CNP-layers possessing adequate physical properties. CNPs will be chemically modified to render enhanced antimicrobial properties. Antibacterial activity of the sterilized layers will be proved by microbiological experiments with selected strains of bacteria, moreover, safety of the products will be confirmed. The technology will be adopted to automatic process with utilization of designed and manufactured, Portable Laboratory Stand. Undertaken works will result in the market product of validated antibacterial composite coating.

CENTAUR

CENTAUR aims to develop a family of functional materials based on oxide ceramic matrix composites (CMC) that are reinforced with oxide ceramic fibres and carbon nanostructures. The new material is provided with integrated sensing capabilities and can be produced by 3D printing methods, which enables inline continuous reinforcement while controlling fibre's orientation. The thermo-mechanical and durability properties are improved (fracture tough, thermal shock resistant, quasiductil, corrosion-resistant), with a lower density (e.g. than Ni superalloys). The material can be used as primary structure in high temperature applications (withstanding temperatures up to 1350°C) for online and non-invasive process inspections, such as structural health monitoring. Two functional prototypes for the aerospace and automotive sectors will be produced and validated at TRL4, including an improved software for modelling the mechanical properties and further optimize mechanical and sensing performance.

cladHEA+

The main ambition of cladHEA+ is to be pioneer in the material science of High Entropy Alloys (HEA) while at the same time contributing significantly for their introduction in the industrial field as innovative substitutes for state-of-the-art coatings used under severe conditions currently based on critical materials. The attraction but also the challenge of HEA lies in its enormous range of possible combinations in terms of type, number and amount of elements, and resulting properties. Supported by modelling and simulation programs, the HEA systems will be systematically selected, studied and characterized within this project. This innovative approach, based on in-situ alloying by laser cladding, implemented by an international Consortium working in a complementary manner, significantly shortens the development and transfer time of the HEA systems to industry (resource efficient screening). Within cladHEA+ an Open-Source Database on HEA will be created for further R&D advantage.

C-MOF.cell

Global concern over climate change related with the emission of hazardous chemical species together with high global demand for energy have led to an increase in the development of technologies related with renewable energy sources. In this scenario, it urges the development of new materials/technologies for the sustainable production and storage of energy, improving their efficiency, durability and environmental compatibility while decreasing their cost. The C-MOF.cell project aims to develop novel functional advanced materials for proton-exchange membrane fuel cells that are efficient, affordable and robust in a broader range of operating conditions than can be achieved with current materials. Specifically: novel non-precious metal catalysts for oxygen reduction reaction will be prepared to replace costly Pt in the cathode, while proton-conductive membranes based on Metal-Organic Frameworks will be developed as highly stable electrolyte. C-MOF.cell has the potential to significantly influence EU's energy system (from availability to energy consumption), potentially decarbonising EU and facing the climate change effects.

COSMAG

COSMAG aims at the development of a next-generation permanent magnet (PM), with no content of critical raw elements, that can be found naturally only in some meteorites: L10-ordered FeNi. Theoretical predictions show its potential to compete with the best PMs used in current technology: rare earth (RE)-based NdDyFeB. The primary objective will be to increase the atomic mobility of Fe and Ni using non-equilibrium methods, thus forming L10-FeNi on industrial time scales. COSMAG will address the problematic that Europe is facing to achieve a sustainable technological development with no bottleneck risk originated from the lack of resources and the monopoly by Asia on REs. The project will count with the joint effort of research institutes (IMDEA, IFW, IPSAS) and industry (IMA, UMBRA). The proposed RE-free PM alternative will impact straightforward on technology development (electromobility, renewable energy technologies…) and patents in Europe, and will propel EU SMEs and strength LEs.

Eco-OLED

We invented the first natural light-style OLED with the incorporation of a nano-layer of carrier modulation material between two sunlight complementary emission layers. It could be a cure to melancholy or even suicidal tendencies that arise due to the lack of sunlight during the long winters in northern countries. However, the difficulty in a simultaneous control of the chromaticity and luminance has prevented this invention from further commercialization for many years. We have eventually been able to devise some new approaches to generate natural-style emission that is not only color temperature and luminance tunable, but also relatively high in the obtainable brightness and light quality. Specifically, we plan to achieve an omni-friendly OLED with a color temperature tunable from 1,400 K to 5,500 K, an SRI of > 95, a lifetime > 60,000 hours, a power efficacy of 140 lm/W, and a commercially viable prototype of OLED panel with an emitting area of 5 x 15 cm^2 or 10 x10 cm^2.

ENZ4IFACES

Stability is paramount in biocatalytic coatings. Maximising stability relies on using highly stable enzymes from extremophiles as catalysts. Enz4ifaces proposes high-performing, innovative enzyme coatings for sensor devices, answering the need for rapid and low-cost on-site analysis in the agro-food sector. Innovation is mainly directed at obtaining stable, highly active, and environmentally-friendly inks based on a novel aldehyde dehydrogenase from a hyperthermophilic archaeon. The coatings are applied on electrochemical interfaces by industrial manufacturing methods. The coated interfaces will be validated for (1) the detection of dithiocarbamate fungicides in grapes and tomatoes and (2) the detection of acetaldehyde in wines, relevant for the agro-food sector. The project starts at TRL 2 and reaches TRL 5, rallying partners from Romania, Spain, and South Africa aiming to increased competitiveness, scientific visibility and profit and enhanced Europe - South Africa collaboration

fingerIMPLANT

Finger amputation is final surgery after traumatic injury, if replantation fails due to severe tissue damage. However, absence of even a single finger and thumb (~15.000 patients/year in EU) results in major disability (precise grasping, grip power) and strongly impacts life of frequently young victims. Currently, toe-to-hand transfer is only available microsurgical reconstruction. Closing this gap is aim of our R&D group by combining (1) patient-tailored finger bone & joint implants (fingerIMPLANT target) and (2) nerve grafts during soft tissue reconstruction to retrieve sensation. fingerIMPLANT joins scientific and industrial specialists in advanced “3D-printing” of high-elastic metals (beta-titanium) and non-wearing ceramics without ossification (Al2O3-ZrO2) for implants, in anti-microbial hydroxyapatite coatings for their optimized integration into bone, and in microsurgery for creating templates for future straightforward implant construction from CT images prior to 3D-printing.

GADEIRE

Mid-InfraRed light can be used to detect a wide range of molecular species (e.g. to identify, hazardous air pollutants in the environment or explosive materials), and is an eye safe wavelength region for users. Mid-IR optical fibers could have a very high impact on the monitoring and safety of both our life and nature, through their employment within compact, flexible devices, immune to radiation interference. Silica based optical fibers have superior mechanical resistance and reliability properties but their possible exploitation is today limited by their poor performance in the mid-IR. The GADEIRE project is about the development of a new generation of hollow core fibers that will allow using silica based optical fibers up to a wavelength of 7 □m. They will be used in combination with optical sources with an extended mid-IR bandwidth and laser-based gas sensing techniques, allowing simultaneous detection of a broad range of gases hazardous for the environment and human life.

HEMP4NZEB

The project’s goal is to promote development of the nearly zero-energy buildings (NZEB) industry and EU state’s bio-economics by development of manufacturing technology of the new building products made of high performance ecological fibre composites. These composites consist of a non-organic binding matrix reinforced by natural fibre, incorporated with microencapsulated phase change materials (PCM) which will increase thermal mass of the building product. Storage concept applied to new building products has been classified as passive thermal energy storage (TES) systems that can enhance effectively utilization of the naturally available heat and cold sources in order to maintain the comfortable conditions and wellbeing in buildings and minimize the use of traditional heating or cooling systems. For demonstration purposes it is planned to design prototypes of envelope elements (multi-layered panels and building blocks/bricks) with layered structure with microencapsulated PCM.

Hybrid_beams

The project focuses on the development and testing of a hybrid bus structure parts that will be a combination of CFRP, foam and stainless steel. Special intention is focussed to lower the structure mass and increase stiffness resistance to crash and fatigue damage. The new bus structure concept with the addition of carbon fibre and foam, use as local reinforced, makes the new light structure more useful and effective to electric buses, hydrogen buses and CNG buses. The behaviour of the real hybrid structure will be demonstarted by tests and FEM calculation on a part of bus structure.

HYSUCAP

This project aims at demonstrating the application of novel two-dimensional (2D) hybrids as high-performance electrode materials for supercapacitors (SCs). A series of 2D hybrids will be designed and fabricated based on 2D MXenes and 2D black phosphorous (BP). With the assistance of multi-scale materials characterization techniques and advanced data analysis algorithms, new knowledge will be generated to provide fundamental understanding in the efficient design of 2D hybrids for high-performance SCs. Based on the developed 2D hybrids, two kinds of SC devices, including thin-film SCs and microsupercapacitors, will be built. These advanced SCs will demonstrate the great potentials as power source for emerging portable and micro- electronics. The success of this project will promote the efficient utilization of renewable energy sources and meet the European strategic policy targets in terms of greenhouse gas emission reduction and development of affordable sustainable energy sources.

INJECT-BIO

Oral soft tissue regeneration after ablative surgery or trauma is still a challenging goal in today's clinical routine. Currently available biomaterials in the market act as soft tissue fillers, but cannot ensure the bioactive response and/or ingrowth of gum-derived cells. In INJECT-BIO project, the development of advanced biomaterials and drug delivery systems for oral soft tissue regeneration will be investigated by applying Halomanas levan and bacterial cellulose-based injectable hydrogels containing IGF-1 and cannabis extract/cannabidiol liposomal simultaneous delivery systems. The project consortium unites the expertise, complementary skills and infrastructure of researchers and professionals from 5 countries – Latvia, Lithuania, Israel, Turkey and Czech Republic. The INJECT-BIO project will generate advanced know-how and knowledge of hydrogel-cell interactions leading the product till TRL4, giving a great potential for INJECT-BIO results to be transferred in the market.

INNENERMAT

The project will be focused on the development of novel active materials for competitive energy storage devices: batteries and supercapacitors (SC) with a focus on the main components: active material, electrolyte and design of the device. It is planned to design structurally and chemically advanced functional carbon materials, smart textiles, metal oxides and hybrid materials to make a substantial advance in performance. Besides, improvements in the electrolytes through developing new polymers and gels will also be considered. Finally, due to the multidisciplinary consortium, it will be also possible to design flexible concepts for storage devices, with special emphasis in textile-based technologies. The participation of the industrial partners will allow to integrate easily all the new developments and to perform a proof-of-concept for different applications, allowing to reach TRL6 for flexible batteries and supercapacitors at the end of the project.

interBATT

In the context of the energy transition, batteries are a key technology to address the transformation of the energy system. However, Li-ion batteries are still facing safety issues and despite continuous progress, performance improvements are mainly incremental due to materials and interface constraints. interBATT targets the development of material solutions for the engineering of critical interfaces to enable implementation of the high capacity anodes silicon and lithium to increase energy density, while ensuring cycle life, safety and rate capability. Ultimately this will unlock a technological path towards Li-based next-generation batteries. Interfaces will be engineered with industrially relevant nano-coating techniques. The most promising solutions will be integrated in a scaled-up prototype pouch-cell representative of an industrial environment. interBATT will contribute to the establishment of an European value-chain, covering all aspects from fundamentals to battery cells.

ISIDE

ISIDE aims at reducing the implant failure risk due to bacterial infection and/or poor osteointegration and/or fit, while avoiding any second surgery. The new implants' generation will be highly customised and made of a resorbable metal: Magnesium (Mg). The implants will be produced using innovative processes, no more based on the subtractive approach: sheet metal forming processes like Superplastic Forming and Incremental Forming will be used. Mg custom implants will be improved by means of bioactive biofunctionalization aimed to (i) boost the bone formation; (ii) reduce the bacterial infections during healing; (iii) manage the corrosion/degradation time according to the region where the prosthesis is implanted. Potential benefits are mainly related to the improvement of patients' life quality, due to the reduction of the hospitalization time (only 1 surgery and fast production process) and to the improvement of the implants performances (aesthetical and mechanical requirements).

IsoWire

The essence of IsoWire project is combination of a urological guide wire with active coating to avoid pre-stenting during kidney surgery. IsoWire is a urological guide wire with bio-compatible hydrogel coating capable of rapidly eluting vasoactive substance like Isoprenaline to affect muscular tone of the smooth muscles in the wall of mammalian ureter. The use of active-hydrogel surface would reduce incidence of iatrogenic ureteric trauma associated with such instruments insertion. The benefits of such novel device will be realized without changing or significantly modifying current practice that involves insertion of a plain (non drug eluting) guide wire. The impact of such device if proven to be effective and beneficial in reducing cost of treatment due to reduction in pre-stenting requirements. Hence patient stent related symptoms and associated with them absenteeism will be reduced. Furthermore, cost to health funders and medical waste production will be significantly decreased.

LaMoFlo

The easy emptying of waste containers through non-stick, self-emptying containers would be a welcome innovation with a large environmental gain. Our research team from McGill University, École de Technologie Supérieure and Mittweida University of Applied Sciences has teamed up with a bulk and food-packaging manufacturer, IPL Inc., and a manufacturer of polymer injection molds, Moulexpert Inc., to develop an industrially viable process to laser texture molds for the fabrication of functional polymer sur-faces. The objective is to revolutionize the packaging sector by producing multi-scale textures on oblique sur-faces needed for damage-free demolding of 3D polymer parts. Thereby, high-power lasers with ultrafast scan systems will be used for energy-efficient and flexible 3D high-rate machining. This will ensure easy recycling of the monolithic containers, less food wasted, and easier compost handling that will reduce landfill waste and protect the environment lead to business growth."

LiBASED

A battery-supercapacitor hybrid systems combine the advantages of high energy battery electrodes and high power capacitors. LiBASED consortium is aiming the development of the new and efficient Li-ion battery-supercapacitor hybrid (LIH) device with high power and energy density simultaneously, along with good cyclability. The project proposes a novel hybrid device configuration based on different 3D nanostructured carbon based cathodes and electrospun titanate-based free-standing (anode) electrodes. By using this configuration, the LIH device is expected having high energy density (>20 Wh/kg) and power density (>5 KW/kg) with a specific capacity retention >92% over 10,000 cycles. Afterwards, the consortium will design and fabricate mini-hybrid device (prototype) with mentioned outputs. The assembled LIH devices can be applied in long-run, lightweight and cost-effective unmanned air/ground vehicles (UAVs, UGVs) which will to lead positive effect on both environmental and economic issues

LIGNP4WOUND

An increasing number of persons show difficulties for wound healing and the resistance of an increased number of pathogens to antibiotics or other drugs also makes the skin wound healing process more complicated. In parallel, more care is given to the cytotoxicity of biocides or compounds used in medical implants or dressings and the impact on the environment after their disposal. The LIGNP4WOUND addresses all these problems by adding natural biocides (lignin and chitosan) and bioactive molecules to the biodegradable nanofibrous mats made by electrospinning. Besides, solid lipid particles loaded with antibiotics will be tested as another option. The proposed wound dressings are composite materials and their performance will strongly depend on the adhesion and cohesion of the various composite parts. Thus, one of the project objectives is to use environmentally friendly plasma chemical technologies to achieve the desired stability of the final composite material.

MERF

The project deals with the development of new flame retardants for carbon fiber reinforced epoxy laminates. These retardants should be more environmentally friendly than most so far used flame retardants. Newly developed compounds will be based on cyclic or polymeric phosphazenes, or other usable derivatives of phosphorus oxytrichloride. At the same time the project should contribute to knowledge of the relationship between structure and properties. Legal protection of the resulting composite is assumed a utility model or a functional sample.

MiDICoat

In this project, chemical vapour deposited (CVD) Ti(C,N)/Al_2O_3 coatings with new interface architecture are developed. Protective coatings based on the Ti(C,N)/Al_2O_3 stack are currently used in high-speed turning applications. They combine a high wear resistance of the titanium carbonitride with the excellent high-temperature oxidation resistance of aluminium oxide. However, the CVD Ti(C,N)/Al_2O_3 coatings are still suffering from an insufficient adhesion at the Ti(C,N)/Al_2O_3 interface and from the formation of voids between the Al_2O_3 grains. The aim of the project is to improve the interface cohesion via interface design that includes tailoring of the phase composition and morphology of the interfaces, modification of the grain size and adjustment of the ideal preferred orientation of crystallites. Our approach is based on specific alloying of the main components that will improve the heteropitaxy between adjacent phases, stabilize metastable phases and produce desired lattice strains.

MiLaCo

The project MiLaCo addresses the development of novel optical components based on nanostructured thin films for the advanced micro laser systems and laser micro resonators. The main objectives of the work are to fully investigate and develop GLAD method for manufacturing zero angle polarizers and spatial filters using nano-engineered multilayer coatings. Optical components with polarisation control and spatial filtering functionalities will improve the performance of the micro lasers by one order of magnitude. The proposed technology will enable crucial advancements in micro laser systems and will become a key method for the new market of micro lasers.

MultiMat3

The core innovation objectives for MultiMat3 are the development and optimisation of new polymer material compounds, and new polymer material combinations for Additive Manufacturing (AM). Specifically, these materials are for use in Fused Filament Fabrication (FFF) and the droplet-based ARBURG Plastic Freeforming (APF). The focus will be on the following materials due to their innovative potential:

- Layered Double Hydroxide (LDH) based nanocomposites for improved dimensional precision and mechanical properties
- Semi-crystalline polymer compounds, such as polyamides (PA), for high temperature applications
- Thermoplastic Elastomers (TPE) applied in hard-soft material combinations
- Polycarbonate (PC) for optical parts

MultiMat3 has the potential for significant scientific and commercial impact, for all involved partners, through the generation of valuable intellectual property (IP) guided by a clear plan for the exploitation and dissemination of project results.

NANOPOL

Nanocellular polymers (cells in the nanoscale) represent a breakthrough in the field of thermal insulation of buildings due to the combination of ultra-low thermal conductivity (≤ 12 mW/mK) and low cost (≤10 €/m^2), which are not achievable with current materials. However, density of these materials (≥200 kg/m^3) is still too high to have ultra-low thermal conductivity, which is the main bottleneck identified towards reaching a TRL 4. NANOPOL project aims at exploring innovative strategies in the field of nanocellular foams to reduce density, such as forming external layers reinforced with nanoparticles and creating a bimodal cellular structure in the inner core. In addition, a new heat transfer model and a LCA will be developed, which will help to identify key aspects to reduce further thermal conductivity and to quantify the key environmental impacts of these revolutionary materials: cutting down the energy consumed in buildings and reducing raw material consumption and GHG emissions.

NATALINA

The use of natural fibre reinforced composites is in a constant expansion particularly in automotive industries due to their low cost, low density and good mechanical, and thus low environmental impact and recyclability. One of the barriers to the uptake of this class of composites is the perceived uncontrolled variability in properties, low productivity and cost associated with the manufacturing of finished parts. NATALINA aims to answer these major drawbacks through the development of an innovative processing technology and by reuse of prepreg off-cut waste as discontinuous flakes and suppress organosheet & stamping wastes. At the end of the project, this concept will be validated on a semi-pilot line scale and a representative demonstrator at TRL5. An industrial board will be associated to the project, from the product specificity until the demonstration in order to reduce time-to-market of project’s result.

NewILUMIS

NewILUMIS project aims at developing a novel functional material based on a layered ceramic, associated to a surface plasmon resonance (SPR) structure and a mesoporous topcoat as an innovative photonic component for lighting/sensing. The target areas will be environmental protection and security, medical diagnostics, biosensing and chemical compound detection. The core of the lightning structure will be a rare earth doped (RE3+) ceramic (YAG). Its layered construction will allow tailoring the spectral and spatial characteristics of the light source under LED excitation. The ceramic composition (active dopants, scattering phase material, etc.) will be modified to obtain the desired colour rendering index and a high efficiency of the resulting source. This light source will be used for sensing when combined to SPR and functionalized mesoporous coatings. Packaging issues will also be considered to produce a demonstrator whose performance will be tested in relevant industrial applications.

NovCom

The NovCom aims at development of Cobalt free enhanced Tungsten Carbide based diamond composites produced with use of pulse plasma compaction (PPC) technology. The NovCom composites will enable long lasting tools for hard to machine materials like Nickel alloys or fiber based polymer composites addressing the need in high performance cutting applications in EV, wind turbines manufacturing and aerospace. The NovCom Cobalt free composites will be characterized by:

1. High hardness, strength and fracture toughness due to enhanced interface design of Me-WC and Diamond (≥ 30 Vol-%)
2. Tailored thermal properties - incorporation of diamond particles with different size and different volume fraction
3. Durability: Life time of the composites will be increased by increasing the thickness of the cutting layer. PPC enables composites with reinforcing phase in its entire volume.
4. Recyclability features such as the possibility of resharpening of the tool and near net shape manufacturing.

OxyGaN

The objective of the project is to increase the efficiency of GaN blue to blue-violet laser diodes by introducing a novel contact scheme utilizing a bandgap-engineered transparent conducting oxide, ZnMgO:Al with contact interface engineering. Overcoming the standing issues related to contact formation to vertical GaN-based opto/electronic devices, contact structures will be developed, raising the device efficiency by forming stable ohmic contacts to both n- and p-type surfaces, acting as both the metallization and waveguide for p-GaN, fabricated using means taking into account a simplified process integration and resource management. The technology steps developed in the project will be finally integrated in a packaged laser diode demonstrator and the technology will be prepared for implementation on the production line of one of the partners, enabling resource-sustainable, more energy-efficient diodes for automotive, display, welding and patterning industries at lowered costs.

RIPE4TEC

The core technology to be developed in the project is reactive inkjet printing as a technology to enable the additive manufacturing of novel thermoset composites based on epoxy-polyamine resins. The technology will allow not only for printing parts of complex shape without the need for casting or subsequent processing, but also the control of the microstructure. We will pioneer heterogeneous epoxies, composed from hard and soft microscale subdomains, with contrast and spatial distribution, which will be designed by modelling such to enhance the overall material toughness, without compromising its strength and modulus. Functionalized nanoparticles will be introduced at specific sites to either produce reinforcement or to enhance energy dissipation. The work will greatly broaden the range of applications of epoxies, will lead to a new thermoset printing technology and will introduce new material design concepts with diverse applications.

SALMOS

Protecting the society from hazardous gases and explosive materials is an important need that may be addressed if versatile, cheap and user-friendly detection devices are developed. The project SALMOS aims at the development of optical sensors based on photoluminescent metal-organic frameworks (LMOFs) processed into films and distributed arrays for the detection of explosives and toxic substances in the gas phase. Enhanced sensing performance will be achieved by using improved approaches for the immobilization or direct growing of the MOF crystals into specific substrates like polymeric matrix membranes or nanostructured metal oxide films. The combination of selected sensitive MOFs assembled into arrays or groups of sensors will enable for selective analyte recognition exploiting their (multi)luminescent response spanning across the visible spectral range. SALMOS will focus on explosive vapours (nitroaromatics, TATP), toxic gases (NO2, SO2) and other toxic volatile organic compounds.

SEAM-PP

PP/PE plastics are very interesting for a wide range of applications. This project focuses on large-sized parts (volume 0.03 to 1,5 m^3) available on the market in medium-sized quantities (< 5'000 pcs/year). Existing production processes are expensive; therefore, 3D printing of such parts is of great interest. However, established 3D printing processes are unprofitable for such parts, because of limited building space. Very long process times and high material prices lead to high costs. SEAM (Screw Extrusion Additive Manufacturing) of Fraunhofer IWU has enough space, high printing speed and uses standard plastic granules. This could solve the current problems, but the technology is only tested with the much easier to process material PA CF. Further development of processing technology, PP/PE material modifications, design rules for the parts and process simulation are worked out in a consortium of German and Swiss partners.

SensCoat

This proposal is focused on the development of innovative coatings and functional surfaces for Point of Care (PoC) medical diagnosis. A novel device, depending on a multiple layers of high technology surface coatings and surface modification will be developed and validated for a specific final application: differential diagnosis of viral respiratory tract infections, to help containing the outbreak of antimicrobial resistance (AMR) by reducing unnecessary prescription of antibiotics. Developing such a device to be available as a PoC diagnostic system will not only have a national, but a global impact; where WHO emphasizes that greater innovation and investment are required in research and development of new antimicrobial medicines, vaccines, and diagnostic tools to fight with AMR, globally. By optimising surfaces via optimising precise surface coating procedures, in this project, a high technology product that is capable of specifically detecting microorganisms is being developed. This project will start from a TRL 2-3 level and targeting a TRL 6 by the end of the project.

SmartMatter

SmartMatter proposes novel functional materials featuring magneto-plasmonic properties and validated capability for boosting sensitivity to environmentally relevant analytes. Adaptive 3D-nanoplatforms will enhance the analytic response of (magneto)optical waveguides sensing chips encompassing analyte specific interaction sites. SmartMatter sensors become active, dynamic amplifiers of the target specific reactions that modulate their structure. Nanoparticle/dynameric conjugates are set to play a double role: as framework for optical waveguide and as sites for interaction with the analytes. SmartMatter monitoring and interconnectivity capabilities will support reduction of greenhouse gas emission by providing a flexible network of sentinel sensors. Wider impact is foreseeable for energy field where the novel materials warrants enhanced catalytic power, improved sensitivity, specificity and compatibility with portable formats strengthening European innovation and industrial leadership.

TRAVEL

The project involves functional materials applied to semiconductor vertical-cavity surface-emitting lasers (VCSELs) that are the smallest coherent light sources, widely used in very fast-growing photonics industry including LIDARs, time-of-flight sensors, autonomous vehicles, robots and drones. The product will benefit from considerably lower electrical power consumption and higher performance compared to the existing solutions. As VCSELs sector is developing dynamically with lasers' production expected to double in the next five years, the Proposal has the potential to significantly contribute to the reduction of lasers' global energy consumption and to the decrease of harmful and hard-to-obtain materials required in their production. We expect that proposed transparent electrode will outperform existing solutions for electroluminescent diodes, detectors, solar cells and interactive optoelectronics. This project is expected to trigger further works focused on development and applications of transparent electrodes for other photonic devices.