M-ERA.NET Call 2022:
List of projects recommended for funding

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Materials for energy	AM2pC	Novel two-phase cooling systems for data centres through additive manufacturing	4	Heatflow ApS (DK) Danish Technological Institute (DK) Fraunhofer IWU (DE) Open Engineering (BE)	IFD (Denmark) SMWK (Germany) SPW (Belgium)
Materials for energy	DC-PEM	Development of a Cost-effective anode for PEM water electrolysis	5	Hochschule Mittweida (DE) Fraunhofer-Institut (DE) University Politehnica Timisoara (RO) University of Chemistry and Technology Prague (CZ) LEANCAT s.r.o. (CZ)	SMWK (Germany) UEFISCDI (Romania) TACR (Czech Republic)
Materials for energy	H2MobilHydride	Development and Processing of Advanced Metal Hydride Composites with Specific Microstructure Properties for mobile hydrogen storage applications	4	Západočeská univerzita v Plzni (CZ) SVÚM, a. s. (CZ) Ustav Materialoveho Vyskumu Slovenskej Akademie Vied (SK) Technische Universität Chemnitz (DE)	TACR (Czech Republic) SAS (Slovakia) SMWK (Germany)
Materials for energy	HetCat	Engineering of two-dimensional heterostructural photocatalysts for hydrogen generation	3	Jožef Stefan Institute (SI) National Taiwan University (TW) Institute of Solid State Physics, University of Latvia (LV)	MIZS (Slovenia) NSTC (Taiwan) LZP (Latvia)
Materials for energy	HIDDEN-PV	New wide bandgap photovoltaic devices based on sustainable materials and eco-efficient processes for ubiquitous integrated PV applications	3	Fundacio Institut de Recerca de L'energia de Catalunya (ES) Universite du Luxembourg (LU) Valstybinis Moksliniu Tyrimu Institutas Fiziniu Ir Technologijos Mokslu Centras (LT)	AEI (Spain) FNR (Luxembourg) LMT (Lithuania)

[1] Participants requesting no funding are marked with an asterisk and printed *in italc type*.

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Materials for energy	INNOHYPPY	INNOvative catalyst and its regeneration for clean HYdrogen Production via methane PYrolysis	3	Lithuanian energy institute (LT) Institute of Solid State Physics (LV) Institut Jozef Stefan (SI)	LMT (Lithuania) LZP (Latvia) MIZS (Slovenia)
Materials for energy	IsoFoamComp	Development of a functional composite insulation and foam material for battery housings	4	Isovolta AG (AT) Polymer Competence Center Leoben GmbH (AT) Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung EV (DE) Association pour l'environnement et la securite en Aquitaine (FR)	FFG-Mdz (Austria) SMWK (Germany) RNAQ (France)
Materials for energy	LightCell	Quasi-1D materials for advanced thin-film photovoltaics	6	LightNovo (DK) DTU (DK) NIMP (RO) DGIST (KR) ULTECH (KR) TALT (EE)	IFD (Denmark) UEFISCDI (Romania) KIAT (South Korea) ETAG (Estonia)
Materials for energy	NAMEAS	Novel asymmetric anion-exchange membranes for fuel cells	5	Sabancı University Nanotechnology Research and Application Center (TR) **Technion- Israel Institute of Technology (IL)* Commissariat à l'énergie atomique et aux énergies alternatives (FR) Jagiellonian University (PL) Energy and Nuclear Research Institute (BR)	TUBITAK (Turkey) ANR (France) NCN (Poland) FAPESP (Brazil)
Materials for energy	STEEP UP	Steep absorption with supramolecular self-assembled functional dyes for vacuum-deposited organic solar cells	5	Leibniz-Institut für Polymerforschung Dresden e.V. (DE) Heliatek GmbH (DE) Institute of Organic Chemistry (PL) CNRS (FR) University of Mons (BE)	SMWK (Germany) NCN (Poland) ANR (France) FNRS (Belgium)
Materials for energy	TBC4H2	Thermal Barrier Coatings for greener heat-to-power applications: understanding limits of operation under hydrogen combustion and sustainable outlook	5	Łukasiewicz Research Network – Institute For Ferrous Metallurgy (PL) Avio Polska Spolka z Ograniczona Odpowiedzialnoscia (PL) Silesian University of Technology (PL) Mines Paris (FR) Fraunhofer IWS (DE)	NCBR (Poland) ANR (France) SMWK (Germany)

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Innovative surfaces, coatings and interfaces	ALD-SE	Surface protection and interfacial optimization by ALD-coatings on sulfide-based solid electrolytes (SE)	3	Fraunhofer Institute for Ceramic Technologies and Systems IKTS (DE) Beneq Oy (FI) Universidade de Sao Paulo (BR)	SMWK (Germany) BF (Finland) FAPESP (Brazil)
Innovative surfaces, coatings and interfaces	ATOSENS	Atomic-layer 3D printing as a new paradigm for smart sensorics	4	Institute of Electrical Engineering, Slovak Academy of Sciences (SK) ATLANT 3D Nanosystems Aps (DK) National Yang Ming Chiao Tung University (TW) *Comenius University Bratislava (SK)*	SAS (Slovakia) IFD (Denmark) NSTC (Taiwan)
Innovative surfaces, coatings and interfaces	AtraumaBioMat	Advanced metamaterials dedicated for cardiovascular surgeries to minimize tissue injury	9	Silesian University of Technology (PL) CHIRSTOM Marcin i Marek Dyner s.c. (PL) Institute of Metallurgy and Materials Science of Polish Academy of Science (PL) Jan Dlugosz University in Czestochowa (PL) Polymer Competence Centre Leoben GMBH (AT) Joanneum Research Forschungsgesellschaft MBH (AT) Kocaeli Universitesi (TR) DISTECH Disruptive Technologies GmbH (AT) Professor Zbigniew Religa Foundation of Cardiac Surgery Development (PL)	NCBR (Poland) FFG-Pdz (Austria) TUBITAK (Turkey)
Innovative surfaces, coatings and interfaces	InCoatBat	Inert Coatings for Prevention of Ageing of NMC Cathode for Lithium-Ion Batteries	6	Institute of Solid State Physics, University of Latvia (LV) *National Institute of Chemistry (SI)* National Taiwan University (TW) Sidrabe SIA (LV) Center for Solar Energy and Hydrogen Research Baden-Württemberg (DE) Varta Microbattery GmbH (DE)	LZP (Latvia) NSTC (Taiwan) Jülich (Germany)
Innovative surfaces, coatings and interfaces	IronWorkCoat	High-manganese steels to develop gradable coating systems by work hardening for sustainable wear protection applications	5	Chemnitz University of Technology (DE) Wroclaw University of Science and Technology (PL) Amazemet Sp.z o.o (PL) HS Technik Beschichtungstechnologien GesmbH (AT) Iskenderun Technical University (TR)	SMWK (Germany) NCBR (Poland) FFG-Pdz (Austria) TUBITAK (Turkey)

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Innovative surfaces, coatings and interfaces	LiMeCore	Lithium Metal Coating Technologies for Future Generation Batteries	5	Fraunhofer Gesellschaft (DE) Technische Universität Dresden (DE) VITO (BE) MPG (BE) NTUST (TW)	SMWK (Germany) VLAIO (Belgium) NSTC (Taiwan)
Innovative surfaces, coatings and interfaces	MASTER	Mastering Electrode Surface to Achieve Ultra-High Reversible Capacity	4	Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences (BG) Universidad de Cordoba (ES) Inonu University (TR) TÜBİTAK Rail Transport Technologies Institute (TR)	BNSF (Bulgaria) AEI (Spain) TUBITAK (Turkey)
Innovative surfaces, coatings and interfaces	SLAP	Stabilization of Lithium Metal Anodes with Porphyrin-based Electrolyte Additives	4	Karlsruhe Institute of Technology (DE) Danmarks Tekniske Universitet (DK) Nano Science Technology GmbH (DE) Jagiellonian University (PL)	JÜLICH (Germany) IFD (Denmark) NCN (Poland)
Innovative surfaces, coatings and interfaces	STELLAR	Surface Texturing with Laser for Large Areas with Riblets	3	Hochschule Mittweida (DE) IZERTIS S.A. (ES) AMPLITUDE (FR)	SMWK (Germany) IDEPA (Spain) RNAQ (France)
High performance composites	3DBiofibreGoes Auto	Lightweight biobased composites for improved functionality by additive manufacturing for automotive industry	5	Luxembourg Institute of Science and Technology (LU) Kompetenzzentrum Holz GmbH (AT) BPREG Kompozit ve Tekstil Mühendislik Danismanlik Sanayi Ticaret AS (TR) TRIPAN Leichtbauteile GmbH & Co KG (AT) ALPEX Technologies GmbH (AT)	FNR (Luxembourg) FFG-MdZ (Austria) TUBITAK (Turkey)
High performance composites	HAMAAC	Healable Al alloys Manufacturing by Advanced Automated Characterisation	6	Université catholique de Louvain (BE) CEITEC BUT (CZ) CACTUX (CZ) ANY-SHAPE (BE) Thermo Fischer Scientific Brno s.r.o (CZ) FEI SAS (FR)	SPW (Belgium) TACR (Czech Republic) RNAQ (France)
High performance composites	HERO	Thermoplastic elastomers from recycled polyolefins and tires	4	Budapest University of Technology and Economics Hungary (HU) Hochschule für Technik und Wirtschaft Dresden (DE) National R&D Institute for Textiles and Leather (RO) S.C. Monofil S.R.L. (RO)	NKFIH (Hungary) SMWK (Germany) UEFISCDI (Romania)

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High performance composites	HYMOCA	Safe Composite Pressure Vessels with Self Structural Health Monitoring Capacity	5	Luxembourg Institute of Science and Technology (LU) Izmir Institute of Technology (TR) Fraunhofer Institute for Machine Tools and Forming Technology (DE) IZOREEL Composites (TR) Lightweight Structures Engineering GmbH (DE)	FNR (Luxembourg) TUBITAK (Turkey) SMWK (Germany)
High performance composites	MachFlexComp	Machining of Flexible Recycled Composite Components for Electric Vehicles and Aeronautics	6	BaX Composites Inc. (TR) Koc University (TR) Zubiola (ES) Aratz Group Engineering Fabricated Technology S.L. (ES) UMONS (BE) Sobelcomp (BE)	TUBITAK (Turkey) EJ-GV/Innobasque (Spain) SPW (Belgium)
High performance composites	PolyBioMat	Polylactide-based multifunctional materials	5	Chemnitz University of Technology (DE) Bialystok University of technology (PL) Adam Mickiewicz University (PL) Pimar-Plastics (PL) Polymer Institute Slovak Academy of Sciences (SK)	SMWK (Germany) NCBR (Poland) SAS (Slovakia)
High performance composites	SAFER	Self-healing fiber ceramic matrix composite	5	Chemnitz University of Technology (DE) VSB (CZ) University of Sao Paulo (BR) **Opole University of Technology (PL)* Diafrikt Components s.r.o. (CZ)	SMWK (Germany) TACR (Czech Republic) FAPESP (Brazil)
High performance composites	SoftCompEl	Soft Magnetic Composites for Advanced Electrification	5	Teraloop (FI) SpinDrive (FI) Flemish Institute for Technological Research (BE) Magnax (BE) Fraunhofer Institute for Manufacturing Technology and Advanced Materials (DE)	BF (Finland) VLAIO (Belgium) SMWK (Germany)
High performance composites	TOP-Crete	Novel bendable thermoplastic rebars for improved durability and sustainability of concrete structures	6	Universitat Politècnica de Catalunya (ES) **HORMIPRESA NEC S.L. (ES)* **ARKEMA (FR)* Centre Technologique Nouvelle Aquitaine des Composites et des Matériaux Avancés (FR) Vysoké učení technické v Brně (CZ) OHLA ŽS, a.s. (CZ)	AEI (Spain) RNAQ (France) TACR (Czech Republic)

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High performance composites	TRANSITION	Transforming waste into high-performance 3D printable cementitious composite	4	Riga Technical University (LV) SIA SAKRET (LV) Slovenian national building and civil engineering institute (SI) Kaunas University of Technology (LT)	LZP (Latvia) MIZS (Slovenia) LMT (Lithuania)
Functional materials	DEMETRA	Defective metal oxides as the next generation of lead-free piezoelectrics for ultrasonic actuators	4	Technical University of Denmark (DK) CTS Ferroperm (DK) Federal University of ABC (BR) Gdańsk University of Technology (PL)	IFD (Denmark) FAPESP (Brazil) NCN (Poland)
Functional materials	HELVA	Hybrid ELectrosynthesis of Value-Added chemicals	3	ICFO - The Institute of Photonic Sciences (ES) Politechnika Lodzka (PL) University of São Paulo, Institute of Chemistry (BR)	AEI (Spain) NCN (Poland) FAPESP (Brazil)
Functional materials	HEWOX	p-n Heterojunctions of Emergent Wide band gap Oxides for self-powered UVC sensing	3	University Complutense Madrid (ES) Nanovation (FR) Technical University Dresden (DE)	AEI (Spain) ANR (France) SMWK (Germany)
Functional materials	LumAI	Luminescent tagging of documents and the method of their mobile detection based on Hyperspectral Imaging and Artificial Intelligence	5	Łukasiewicz Research Network – Institute of Microelectronics and Photonics (PL) 3D-nano (PL) Institute of Solid State Physics, University of Latvia (LV) Vilnius University (LT) Garsu Pasaulis UAB (LT)	NCBR (Poland) LZP (Latvia) LMT (Lithuania)
Functional materials	nanoCANdi	Advanced functional nanomaterials for precise cancer diagnosis	5	UPV/EHU (ES) IMG Pharma (ES) INSERM (FR) CSIC (ES) UNICAMP (BR)	AEI (Spain) EJ-GV/Innobasque (Spain) ANR (France) FAPESP (Brazil)
Functional materials	PECLABEL	Plasmonic Electrochromic Materials for Dual-Band VIS-NIR Smart Labelling	7	University of Liège (BE) Centre National de la Recherche Scientifique (FR) Leitat Technological Center (ES) VTT (FI) **Color Sensing (ES)* Optitune (FI) **NordicID (FI)*	FNRS (Belgium) ANR (France) AEI (Spain) BF (Finland)

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Functional materials	REPLACER	Recycling plastic and developing hybrid living materials by capturing greenhouse gases to produce value-added products	5	Leipzig University (DE) Leibniz Institute of Surface Engineering (DE) qCOAT GmbH (DE) Holisun (RO) University of Latvia (LV)	SMWK (Germany) UEFISCDI (Romania) LZP (Latvia)
Functional materials	SustainFibresFCM	Development of sustainable fibre-based food packaging materials made from agricultural residues using safety-by-design	5	Österreichisches Forschungsinstitut für Chemie und Technik (AT) Łukasiewicz Research Network – Lodz Institute of Technology (PL) Graz University of Technology - Institute of Analytical Chemistry and Food Chemistry (AT) Papiertechnische Stiftung (DE) Agres Systems GmbH (AT)	FFG-PdZ (Austria) NCN (Poland) SMWK (Germany)
Functional materials	Wood-wastePanels	Wood waste containing composites for high performance nearly zero energy building panels	5	Riga Technical University (LV) Warsaw University of Technology (PL) Cewood Ltd (LV) Budynki z konopi (PL) Universite Savoie Mont Blanc (FR)	LZP (Latvia) NCBR (Poland) ANR (France)
New strategies for advanced material-based technologies for health applications	BiLaTex	NEW GENERATION OF BIOACTIVE LASER TEXTURED TI/HAP IMPLANTS	4	Cracow University of Technology (PL) Tallinn University of Technology (EE) University of Ljubljana (SI) ATMAT Sp. z o.o. (PL)	NCBR (Poland) ETAG (Estonia) MIZS (Slovenia)
New strategies for advanced material-based technologies for health applications	DNABEATS	Customised DNA-based nanocarriers to boost heart healing	5	Universidad de Zaragoza (ES) University of Tartu (EE) Fundacion Instituto de Investigacion Sanitaria Aragon (ES) Vilnius University (LT) Jagiellonian University (PL)	AEI (Spain) ETAG (Estonia) LMT (Lithuania) NCN (Poland)
New strategies for advanced material-based technologies for health applications	Nano4Zombie	Senolytic nanoplatform to target and eliminate skin cancer Zombie cells	4	Agencia Estatal Consejo Superior de Investigaciones Cientificas (ES) University of Rzeszów (PL) University of Warsaw (PL) Latvian Biomedical Research and Study Centre (LV)	AEI (Spain) NCN (Poland) LZP (Latvia)

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New strategies for advanced material-based technologies for health applications	NANOFIB	Targeted NANOmedicine to reverse FIBrosis in ischemic cardiomyopathies	4	Fundacion Para la Investigacion Medica Aplicada (ES) Ben-Gurion University of the Negev (IL) Institut de Recerca de l'Hospital de la Santa Creu I Sant Pau Fundacion (ES) FUTURESYNTHESIS SP ZOO (PL)	AEI (Spain) MOST IL (Israel) NCBR (Poland)
Materials for electronics	BEATRICE	Biobased dEgradable flAme reTardant pRInted eCo-elEctronics	4	Hochschule für Technik und Wirtschaft Dresden (DE) Budapesti Muszaki es Gazdasagtudomanyi Egyetem (HU) Institutul National de Cercetare-Dezvoltare Pentru Textile si Pielarie (RO) MONOFIL SRL (RO)	SMWK (Germany) NKFIH (Hungary) UEFISCDI (Romania)
Materials for electronics	Coco	Copper conductive lines with glass insulation by a melt extrusion process	4	Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V. (DE) Technische Universität Bergakademie Freiberg (DE) MicruX Fluidic, S.L. (ES) Wroclaw University of Science and Technology (PL)	SMWK (Germany) IDEPA (Spain) NCN (Poland)
Materials for electronics	MUST	Materials for Ultraefficient chiral SpinTronics	4	Polish Academy of Sciences (PL) Consejo Superior de Investigaciones Científicas (ES) University of Bialystok (PL) Marmara University (TR)	NCN (Poland) AEI (Spain) TUBITAK (Turkey)

Publishable abstract of the projects:

3DBiofibreGoesAuto

Lightweight biobased composites for improved functionality by additive manufacturing for automotive industry

Rationale: Natural fibres composites are important for light weight applications. However, unsolved needs exists, e.g., humidity influences their properties, low ability to withstand high temperatures and limited industrial processes limit their use. Also, many composites are hard to recycle since thermoset resins and many materials are combined. 3DBiofibreGoesAuto will develop natural fibre composites with thermoplastic matrices for composite sandwich panels. Objectives: (1) reduce the water absorption of natural fibres; (2) produce thermoplastic prepregs with biobased matrix and natural fibres; (3) develop recyclable sandwich panels with excellent damping properties; (4) develop non-planar sandwich panels by 3D printing and engineering shaping and assembling tools; and (5) analyse the recycling capabilities of these structures. Applications: Sandwich panels in automotive. Benefits: 3DBiofibreGoesAuto technologies can reduce material waste and power consumption in automotive vehicles.

ALD-SE

Surface protection and interfacial optimization by ALD-coatings on sulfide-based solid electrolytes (SE)

Solid-state batteries using sulfide-based solid electrolytes are compatible with conventional lithium-ion technology, but State-of-the-Art sulfides do not meet the current requirements for chemical and electrochemical stability. This project will investigate a novel surface engineering technology for solid electrolytes to overcome these limitations. By applying coatings, using atomic layer deposition (ALD) to the surfaces of the sulfide particles, we will enable protection against moisture, polar solvents, and suppress reactions at anodic or cathodic potentials. The project will develop novel coatings by ALD. Solid-state NMR will be used aiming to understand the structural effects of the coatings and effects the coatings will have to the sulfide interface. Solid-state battery technology will benefit from the proposed approach by simplified material processing (solvent, moisture compatibility), increased safety (suppression of H2S-formation) and increased cycle life (less degradation).

AM2pC

Novel two-phase cooling systems for data centres through additive manufacturing

Two-phase cooling is gaining novelty due to several advantages (passive, fewer problems with gravity), and an effective conversion of energy sources that are otherwise released as energy losses. The main area is the evaporator (Vapour chamber) located between the hot spot (electronics or battery) and the integrated liquid/gas section. In combination with additive manufacturing processes, vapour chambers show an effective solution for efficient and targeted heat dissipation and heat utilisation. In the AM2pC research project, structures and designs as well as process parameters for the additive manufacturing of these structures are being developed. Specifically, lattice structures (defined rod thicknesses), porous structures (laser process parameters) and fractal structures with copper (micro-alloyed) and AlSi10Mg are to be realised. The result will be novel and highly efficient structure variants that designed for optimal temperature distribution and can only be produced additively.

ATOSENS

Atomic-layer 3D printing as a new paradigm for smart sensorics

Rationale / Needs to be addressed: Project addresses the needs for novel process technologies considering circular economy with minimized waste and use of critical materials, and the need for new smart sensors with in-sensor data processing for the rising hydrogen energy infrastructure. Objectives: Using new rapid on-demand prototyping fab-less fabrication method of atomic-layer additive manufacturing (ALAM) we will fabricate a matrix of non-identical microscopic hydrogen TiO2-based sensing elements, arranged into pre-programmed hardware neural network (HNN). Potential applications: The first application is a fully ALAM-printed prototype of a smart Pt/TiO2-based low-power hydrogen sensor with low-level in-sensor data processing, developed in this project. Impact and potential benefits: Wider adoption of ALAM technology, which we will pursue through the open innovation hub framework, where rapid prototyping of various ALAM-printed HNN designs from stakeholders will be encouraged.

AtraumaBioMat

Advanced metamaterials dedicated for cardiovascular surgeries to minimize tissue injury

The main challenge are excessive clamping and grasping forces and lack of a haptic feedback in most of CardioVascular and Thoracic Clamping and Grasping Instruments (CVTCGI), which may cause severe surgical complications interrupting blood flow or causing life-threatening haemorrhage. Objective of the project is stress sensing to control pressure on tissues and overload protection preventing its damage. The productive objective includes sustainable design-to-reuse & -repair. Innovation for achieving is novel ToolBox Technology (TBT) consisting of enhanced biocompatibile sensors, metamaterials with reversible defined deformation soft-touch surfaces & easy-to-clean coatings. Planned applications of the TBT are atraumatic CVTCGIs in daily clinical practise (clamps, graspers, forceps). Impact and potential benefits are shortened hospitalizations (cost reduction □50%), minimized burden to patients, reduced surgeon workload & carbon footprint.

BEATRICE

Biobased dEgradable flAme reTardant pRInted eCo-elEctronics

The rapid growth of short-lived commercial electronic products causes increasing amounts of electronic waste. The fossil-based nature and persistence of electronic circuit boards contribute to environmental problems, e.g. in the case of waste pollution. The non-recyclable thermosets used so far cause a high carbon footprint and costs for the separation of metals and organic components. Our goal is to develop demonstrators of electronic assemblies using sustainable raw materials as carrier substrates on an engineering scale to enable recycling through a biodegradation process of the composite material as a potential key for cost-efficient and environmentally friendly strategic metal recycling. Potential applications include widely used commercial electronic products with printed circuit boards, particularly short-life electronics. Impact and potential benefits are reduced environmental impact, improved reuse of strategic metals and reduced European dependence on external sources.

BiLaTex

NEW GENERATION OF BIOACTIVE LASER TEXTURED TI/HAP IMPLANTS

Visible effects of society’s ageing is the reported increase in the necessity of orthopaedic implants boosting to a huge economical market. For a successful integration of any implant, bone regeneration, osseointegration at the interface bone and implant as well as mitigating inflammatory events are crucial aspects. The project aims at extending the biocompatibility and tribo-mechanical performance associated with a lifetime of surgical implants based on Titanium (Ti). The hypothesis states combining Ti alloy with hydroxyapatite (HAp), and medically active components (drug delivery function) in order to obtain excellent biomaterial supporting bone growth and eliminating the problem of loosening of the implant by its integration with bone. The project goes beyond the state-of-the-art by laser surface treatment, opening the underlying porosity improving the cell transport and cell growth. The result implant biomaterial, will reduce the number of removal surgeries in the future.

Coco

Copper conductive lines with glass insulation by a melt extrusion process

Copper is the key element in renewable energy generation technologies, printed copper with high temperature dielectric is attracting increasing interest for power electronics and power generation applications. Aim of the Coco project is an innovative material concept for electronic applications, based on copper as highly conductive material and glass as a dielectric material for encapsulation at elevated temperatures. Objectives of the project are the development of the material concept for 3D parts with embedded electrical infrastructure and of high-throughput, energy and material efficient printing technologies to process these materials. Targeted results are a molten metal extrusion pro-cess fed by copper wire, a direct printing process for glass and a hybrid process for

deposition of cop-per and glass in one machine. The feasibility of the material concept is demonstrated by means of electrodes for a highly sensitive, low-cost and reproducible electrochemical sensor.

DC-PEM

Development of a cost-effective anode for PEM water electrolysis

PEM electrolysis represents a key technology in the transformation of the energy sector towards hydrogen as energy carrier and storage. In the project, manufacturing processes are to be further developed in such a way that a more cost-efficient production of PEM electrolyzers becomes possible. To boost performance of the electrolytic cell, the focus must be on the crucial OER at the anode. Starting with the paper production technique to produce highly porous titanium structures as current collectors and porous transport layers, pretreatment techniques as the hydridation of the carrier titanium and catalyst immobilisation based on pulsed galvanic deposition and CVD-processes will be further developed to reduce the use of precious metals compared to state-of-the-art electrodes. At the same time, a process for recovering the precious metals will be developed. An industrial partner in the consortium and a well-established advisory board will ensure the transfer of technology to industry.

DEMETRA

Defective metal oxides as the next generation of lead-free piezoelectrics for ultrasonic actuators

Rationale/Needs: Electromechanical smart materials are like muscles that change their size and exert forces under electrical stimuli. They are in sensors and medical devices and are essential for future technologies. Despite their importance, the best-performing material is an old technology: lead-based piezoelectrics, which is highly toxic. A new class of materials, non-classical electrostrictors, have been discovered. These outperform lead-based piezoelectrics and are biocompatible and inexpensive. However, we still need to assess them for "fast" ultrasounds. Objectives: #1: Understand how non-classical electrostrictors work at the atomic level. #2: Optimise their properties in the ultrasound to prove their industrial competitiveness. Potential applications: Target applications are echo-scan, lab-on-chip, adaptive lenses and ultrasonic manipulators. Impact and potential benefits: We will impact society through industrial innovation and environmental sustainability.

DNABEATS

Customised DNA-based nanocarriers to boost heart healing

Myocardial infarction and its evolution towards heart failure is a leading cause of death in Europe. No curative treatment aside heart transplantation has been accomplished so far. DNABEATS aims to bring advanced materials to regenerate injured myocardium. Cutting-edge DNA nanotechnology is exploited for the fabrication of fully customised biocompatible DNA-based nanocarriers (DNCs) to achieve the cardio-targeted and efficient delivery of a regenerative microRNA. The therapeutic efficacy of DNCs will be assessed in human-derived cardiac cells, a ground-breaking aspect, that together with an exhaustive in vitro and in vivo biocompatibility investigation, will facilitate their future clinical application and industrial transfer. DNABEATS entails thus benefits for multiple stakeholders from industry to patients and clinicians. Sustainability is also present in the project and different dissemination and exploitation actions are planned to maximise the socio-economic impacts.

H2MobilHydride

Development and Processing of Advanced Metal Hydride Composites with Specific Microstructure Properties for mobile hydrogen storage applications

Metal hydrides have recently emerged as promising materials for local hydrogen storage. The innovation goals of this project are to provide a novel metal hydride composite offering hydrogenation capacity close to Mg alloys, faster kinetics, higher dehydrogenation capacity, and limited material degradation per cycle. The material will be based on the concept of high entropy alloy with the addition of catalysts and will be produced not only in the conventional powder form, but also as thin sheets and bulk materials. A hydrogen storage capacity of (H/M)>1.8, a mass fraction of stored hydrogen >2.5, a volume fraction of stored hydrogen >0.15kg/l and an absorption rate to complete saturation < 2min are aimed. The project will improve the fundamental understanding of the mechanisms governing the hydrogenation and high-temperature behavior of HEA-based composites and also provide a functional model of a new composite material for hydrogen storage, followed by a technology for its fabrication.

HAMAAC

Healable Al alloys Manufacturing by Advanced Automated Characterisation

A new high strength healable aluminium matrix composite (hAMC) based on Al-Mg-Sc alloys will be developed, addressing a growing demand of the aerospace and defence vehicles, for light, load-bearing parts with increased lifetime. Parts such as heat exchangers or connectors will be produced by laser powder bed fusion (L-PBF). The hAMC will allow to i) reduce parts replacements frequency by min 50% thanks to its healing capacity; ii) enable weight savings, thus reducing CO2 emissions by decreased fuel consumption; iii) enhance safety by advanced quality control and inspection at early stages of cracking. Their liquid eutectic-phase melting healing will be characterized and subsequently optimized using a dedicated multiscale imaging and analysis protocol. This protocol involves 3D correlative tomography. Upscaling the protocol for industrial use, an automated characterization tool setup for quality control of L-PBF parts will results from Artificial Intelligence (AI) data treatment.

HELVA

Hybrid ELectrosynthesis of Value-Added chemicals

Rationale: the manufacturing of chemicals and carbon-based materials still relies on fossil fuels and energy/carbon-intensive processes. HELVA proposes an alternative approach using CO2 as the carbon source to realize complex carbon-based non-petrochemical plastics powered by renewable electricity. Objectives: HELVA pursues the e-synthesis of polyhydrohyalkanoates (PHAs) from captured CO2 using a tandem system approach that couples CO2 electrolysis and microbial bio-upgrade. We will pursue these goals through advances in catalyst, system, and reactor design, as well as microbe engineering to promote PHA metabolic pathways. Our final objective is the synthesis of PHA at concentrations above 50 g/L. Potential applications: The realization of sustainable biodegradable plastics. Impact and potential benefits: The proposed technology would offer a path for the sustainable biological manufacturing of non-petrochemical renewable plastics, mitigating global emissions and warming.

HERO

Thermoplastic elastomers from recycled polyolefins and tires

Specific innovation objectives and results: Electron beam technology is assessed for sorting of polyolefin mixtures and surface activation of rubber powder at TRL 5. Surface activated rubber powder filled recycled PE and/or PP will be produced. Rationale / Needs to be addressed: The global polymeric waste has doubled to 353 million tons between 2000 and 2019. Only 9 % of polymeric waste was recycled. Highly efficient recycling processes and markets for products made from recycled polymeric waste are required for enhanced recycling rates. Potential application: Surface activated rubber powder filled recycled PE and/or PP can be used for applications in transportation, construction, packaging etc. Impact and potential benefits: HERO will strengthen the production of products from recycled polymeric waste based on “design from and for recycling”. Potential benefits are spreading knowledge for efficient recycling methods, improving innovation capacity, and formation of European partnerships.

HetCat

Engineering of two-dimensional heterostructural photocatalysts for hydrogen generation

Rationale: Photocatalytic solar hydrogen (H2) production from water is non-expensive method, suitable for scale-up, but at the present stage, efficiency is too low for commercial use. Main bottlenecks in achieving high efficiency stem from rapid charge recombination and inefficient solar light absorption. Objectives: Main objectives of the project are: (i) to combine computer modelling and innovative synthesis approaches for designing of new and efficient H2 evolution photocatalysts based on two-dimensional (epitaxial) nanoheterostructures, that have lower charge recombination rate due to small thickness and favourable charge transfer (direct Z-Scheme) and absorb in broad range of solar spectrum due to surface plasmon resonance and narrow band gap, (ii) to perform

advanced characterization to understand interfacial properties and charge carrier dynamics. Potential: The increase in efficiency of solar-driven H2 production is of high importance to decarbonize our planet.

HEWOX

p-n Heterojunctions of Emergent Wide band gap Oxides for self-powered UVC sensing

Uncontrolled fires are estimated to contribute as much to carbon gas emissions as all of commercial transport and must thus be a critical challenge for the EU Green Deal objective of no carbon gas emissions by 2050. A key problem is prompt detection to limit the damage. Most commercial fire/smoke detectors, usually infrared detectors, do not go off until it is too late to intervene. Remote optical sensing should be a big part of the solution. For this reason, there is a need for ultraviolet C band (UVC) flame sensors, which are not subject to such false positives because their photoresponse is solar blind. HEWOX project will explore and contrast the advantages of developing of Ga2O3/NiO heterojunctions (thin films/nanostructure) for use as self-powered remote fire/flame sensors. This approach reinforces the innovative character of the project due to merging of UVC sensing and autonomous operation into a functional materials platform, by employing emerging ultra-wide band gap oxides.

HIDDEN-PV

New wide bandgap photovoltaic devices based on sustainable materials and eco-efficient processes for ubiquitous integrated PV applications

Needs to be addressed: The ubiquitous integration of photovoltaics (PV), key for EU's twin transition, requires novel concepts and technologies that maximize performance and minimize visual intrusiveness in integrated PV applications. Objectives: HIDDEN-PV develops a new generation of earth-abundant low toxicity wide bandgap PV devices based on Sb(S,Se)I for high performance in non-standard illumination and on (Zn,Mg)(O,S,Se) for truly transparent PV. Potential applications: The HIDDEN-PV technology allows hiding the PV elements paving the way to the ubiquitous integration of PV in scenarios such as IoT, building/vehicle/urban integrated PV, agrivoltaics, tandem and bifacial PV. Impact and potential benefits: HIDDEN-PV will have impact at the scientific (fundamental research), economic (impact on different markets and on EU's PV industry), social (availability of PV-powered high tech products) and environmental (distributed PV generation avoiding CO2 emissions and battery waste) levels.

HYMOCA

Safe Composite Pressure Vessels with Self Structural Health Monitoring Capacity

Today, the most efficient and mature means of storing hydrogen is type-IV high pressure composite vessels for on-board applications. However, this technology needs extensive research and development to cut costs and enhance performance and durability to be deployed commercially. Research departments use conservative safety factors for the life cycle/burst pressure ratio and simplified models that lead to over-designed and costly tanks. The HYMOCA project studies new perspectives to design high-performance composite tanks with a self-sensing capacity and provide optimized, safe, and cost-effective solutions for the next generation of high-pressure vessels. An integrated sensing or self-sensing abilities would provide great leverage to reach more economical and designs while remaining safe. The advances of HYMOCA have the potential to open a new range of applications in different sectors, which implies the creation of new market opportunities in the related hydrogen value chain.

InCoatBat

Inert Coatings for Prevention of Ageing of NMC Cathode for Lithium-Ion Batteries

Many state-of-art cathodes for Li-ion batteries (LIBs) experience premature degradation due to surface-related instability. Protective surface coatings deposited on active cathode materials and electrodes is an effective way to improve surface stability, yet a fundamental, quantitative understanding of the working mechanisms of such coatings is still lacking. This project will develop inert protective coatings for significantly extending service life of LiNi0.83MnxCo0.17-xO2 (NMC Ni83) cathode for LIBs based on deep, quantitative understanding of underlying physical and electrochemical phenomena of electrode ageing and its mitigation. Through the contributions of four academia and two industry participants, this project will advance an innovation from fundamental research to pilot scale, demonstrating full Li-ion battery cells with improved service life, and thus helping lead the battery industry to a more sustainable use of resources, energy, and CRMs.

INNOHYPPY

INNOvative catalyst and its regeneration for clean HYdrogen Production via methane Pyrolysis

According to the Sustainable Development Goal on Energy (SDG7) as well as Green Deal, RePowerEU and other EU initiatives, clean energy solutions are essential to counter climate change as well as to reach climate neutrality. The INNOHYPPY project aims at the fundamental and practical investigation of Fe/Ni materials to develop novel catalyst for cleaner and more efficient clean hydrogen production via methane pyrolysis technique as well as their regeneration in order to increase its longevity durability, where all the residues will be used as secondary raw materials for further application. The project reflects to climate change including energy conversion, higher efficiency with improved overall performance, avoiding the use of critical raw materials, utilization of waste material and ensuring the sustainability of the whole process. Besides, lowering the carbon footprint, the project will suggest dual clean hydrogen production (via hydrolysis and pyrolysis reactions) technology.

IronWorkCoat

High-manganese steels to develop gradable coating systems by work hardening for sustainable wear protection applications

Innovative material and manufacturing concepts allow the often-contradictory requirements for processing and functional properties to be met. High manganese steels (HMnS) offer great, untapped application potential in the field of surface engineering. They are characterized by high work hardening under impact and shock loads, which enables applications with superimposed tribological stress. The production of the powder materials by gas atomization and their processing with modern coating technologies such as HVOF and HS-LMD ensure a high material quality of the coating system. Mechanical post-processing allows the property profile to be adjusted with regard to tribological stress. A process combination between thermal coating technologies and the refinement of HMnS coating systems thus enables surface functionalization with gradation of the coating properties by work hardening. IronWorkCoat aims for sustainable coating solutions for applications with superimposed tribological stress.

IsoFoamComp

Development of a functional composite insulation and foam material for battery housings

Besides the raw materials used and the large CO2 footprint during production, the risk of battery fire is one of the major drawbacks that discourages many potential users from using battery storage or from switching to this form of energy storage. The goal is to develop a novel composite material consisting of an aluminium foam component and a thermally switchable polymer layer. With this composite material, passive temperature control of the cells and modules is to be realized, this increasing range and service life. In addition, in the event of thermal runaway of one or more cells, an insulation layer is to be formed that protects adjacent cells and modules. The material to be developed will be used mainly in battery applications such as electro mobility and stationary storage but can be applied in other areas where fire safety is relevant. The development contributes to making battery storage safer and more efficient and thus represents a further step towards climate neutrality.

LightCell

Quasi-1D materials for advanced thin-film photovoltaics

LIGHTCELL aims at developing innovative architectures for thin-film photovoltaics (TF-PV) utilizing inorganic, environmentally stable (Sb2X3, X=S, Se) materials and sustainable fabrication processes with reduced energy consumption. Sb2X3 can be synthesized in a quasi-one-dimensional (quasi-1D) form, addressing the main factors limiting the efficiency of TF-PV, i.e., recombination of the photogenerated carriers at the grain boundaries. A multidisciplinary consortium of academic and industrial partners aims at developing a scalable technology of sustainable, cost-efficient, and lightweight PV. For faster feedback loop to synthesis, a new tool for the rapid and non-destructive mapping of 2D and 3D crystallographic orientation of quasi-1D materials will be developed. The

PV technology developed in LIGHTCELL will be validated in demonstrators by the industrial partners, targeting lightweight building-integrated PV applications, contributing to sustainable green energy production.

LiMeCore

Lithium Metal Coating Technologies for Future Generation Batteries

Clean and cost-efficient energy storage is one of the major challenges for Europe and thus there is a need for high-performance energy storage devices beyond the current SoA. The lithium metal anode is considered to be a key component for next-gen batteries. However, scalable technologies for production of thin Li films with tailored surface properties are still lacking. The objective of LiMeCore is to develop stable lithium metal anodes using scalable manufacturing processes. This will be achieved using innovative interface engineering and surface modification concepts. Improved batteries for BEV are targeted and will be supported by the LiMeCore prototype demo cell. The electrification of the mobility sector and especially, the development of improved batteries is an emerging market opportunity and companies along the value chain can profit from this growth sector. LiMeCore is aiming for bringing innovations to this market and to contribute to a sustainable future and economic growth.

LumAI

Luminescent tagging of documents and the method of their mobile detection based on Hyperspectral Imaging and Artificial Intelligence

The project addresses the need to enhance protection of the security documents (passports, IDcards, tax stamps) against counterfeiting. The objective of the LumAI is to develop a novel class of functional materials and the method of their mobile detection that will be used in an innovative document security system. The luminescent powder will be incorporated into ink and printed on paper or polymer film. The activation will be performed by a model of multichannel flash lamp. For detection, smartphone application based on hyperspectral imaging and AI approach will be used. This technique will facilitate the verification of the authenticity of the documents and help fight against forgery. It allows the user not only to confirm the document but also to identify its producer, which provides additional security. The project represents collaborative design of problem-oriented research and creative integration of knowledge across disciplines including material and computer science.

MachFlexComp

Machining of Flexible Recycled Composite Components for Electric Vehicles and Aeronautics

The use of recycled eco-friendly composite for manufacturing components is a need in circular economy for a more sustainable Europe. This project uses advanced composite engineering solutions to ensure the durability of these materials when undergoing downstream machining processes and proposes adaptations to optimise the integrity of the finished component. The project has four main objectives: (i) use recycled composite materials to reduce material wastage and consumption of energy and resources in manufacturing, (ii) develop fixture devices to prevent workpiece vibrations when machining flexible parts, (iii) develop PCD optimised cutting tools for robotic machining, and (iv) model the complex 3D cutting process of flexible composites parts. Potential applications for these sustainable materials include electric vehicles, micro mobility, air mobility platforms and urban furniture. Successful implementation of the project will enhance the durability of the manufacturing process.

MASTER

Mastering Electrode Surface to Achieve Ultra-High Reversible Capacity

The MASTER aims to advance a new concept for the surface design of electrode materials to achieve reversible capacities that approach the theoretical ones. The proof-of-concept will be validated by the construction of a full Na-ion battery. This battery is targeting to reach the EGD's goals for introducing of affordable large-scale energy storage technology. The specific objectives are: (i) to understand the reactions at the electrode surfaces that currently prevent achieving the theoretical capacity; (ii) to exploit this knowledge to facilitate the elaboration of high-performance electrodes; (iii) to integrate the surface-modified electrodes into a full Na-ion battery; (iv) to maximise the impact of the project beyond the Na-ion batteries. The most innovative output is the MASTER database, by which the lead candidates as electrodes will be selected. The consortium comprises multidisciplinary teams from Bulgaria, Spain and Turkey and it covers the full value chain from TRL2 to TRL4.

MUST

Materials for Ultraefficient chiral SpinTronics

Today, information and communication technologies (ICT) consume over 10% of global energy, with a rapidly increasing trend for the next decades. We urgently need mitigation plans to reduce this toll, and one effective approach consists in developing energy-efficient data storage and computing platforms. MUST aims at exploiting spin-based electronics as an innovative solution to tackle the above issue. In MUST, we will explore and optimize the chiral properties of ultrathin magnetic materials and develop a range of heterostructures and nanometer-scale devices that could lead to novel or improved spintronic concepts. The developed materials and technologies will offer better sustainability, higher energy efficiency, and new functionalities to some of the current ICT products, making a global societal and economic impact. Overall, our efforts will help ease the ever-increasing energy demand in ICT and help Europe maintain its steering wheel toward the 2050 Green Deal objectives.

NAMEAS

Novel asymmetric anion-exchange membranes for fuel cells

NAMEAS proposes a disruptive concept for anion-exchange membranes (AEMs) for improved fuel cells (FCs) for clean energy generation. Current AEMs are not alkaline stable due to the different extreme environments applied at both sides of the AEM in the FC device. To address this, NAMEAS aims to develop novel AEMs beyond the state-of-the-art, with unique asymmetric properties, aiming to impart significantly higher chemical stability. The asymmetric properties of the AEMs will allow withstanding the different conditions at both sides of the AEM in the FC. NAMEAS will optimize the asymmetric AEM chemical composition to maximize its ionic, transport, and stability properties. The AEMs will be tested in real AEMFC devices, guided by advanced characterization and cell modelling. These novel asymmetric AEMs will also be ideal for electrolyzers and flow batteries, where high durability is required, with a huge positive potential impact in the energy conversion and storage market.

Nano4Zombie

Senolytic nanoplatform to target and eliminate skin cancer Zombie cells

Need: With increased age, there is an increase in senescent cells(SC) which can contribute to tumorigenesis. Elimination of cancer-associated SC is a new promising approach to prevent or delay cancer recurrence. However, many of the drugs used as senolytics have shown adverse effects at high doses in clinical trials or low activity. Novel strategies to increase selectivity, bioavailability and activity are needed in order to enhance the effectiveness and safety. Aims: i)Develop new quercetin derivatives with improved action towards cancer SC;ii) Develop a nanoplatform to eradicate skin cancer SC by combining magnetic hyperthermia and senolytic drugs. iii) Analyse the functional effects of SC-derived extracellular vesicles released from treated and untreated skin cancer SC on cells constituting the tumour microenvironment. Application: Aside from a novel and promising anticancer strategy, it could be expanded to other areas such as ageing. Impact: New method to eliminate skin cancer SC.

nanoCANdi

Advanced functional nanomaterials for precise cancer diagnosis

NanoCANdi develops new functional materials and biosensing microtechnology for cancer diagnosis. The project designs and manufactures large magnetic moment nanostructures with unique spin configurations for biomedical applications, specifically optimized for ultra-high sensitive giant magnetoresistance biosensors by micromagnetic modelling of both nanostructures and sensors. It addresses a key strategy in the fight against cancer: the early-stage detection of the disease. A crucial feature in this strategy is the specific biorecognition of cancer indicators. NanoCANdi undertakes this key point creating exclusive aptamers for a precise immobilization of cancer biomarkers, developing an innovative aptakiss/aptaswitch selection approach. The project expands new

technologies and materials, producing biosensing devices that will impact the healthcare system with the adoption of precise medicine, letting physicians to detect and monitor treatments with reliable and affordable biochips.

NANOFIB

Targeted NANOmedicine to reverse FIBrosis in ischemic cardiomyopathies

Rationale: Cardiovascular diseases are leading cause of mortality and morbidity worldwide. A major problem is the progressive formation of a non-contractile scar, leading to severe loss of cardiac function and death. There is a need to develop effective anti-fibrotic treatments, which currently do not exist. Objectives: NANOFIB will explore new materials-based therapeutics that effectively treat cardiac fibrosis. Alginate-Sulfate Nanoparticles (NP) coated with anti-periostin antibodies (thus targetable to activated cardiac fibroblasts), and carrying anti-fibrotic siRNAs will be developed and tested in animal models of myocardial infarction. Potential Applications: The developed NP will be then ready for clinical testing as a potential treatment for cardiac adverse remodelling. Impact and potential benefits: NANOFIB major innovative outcome will be to deliver an advanced coated nanomaterial to be used as a gene therapy delivery system with a great impact on reducing cardiac fibrosis in EU.

PECLABEL

Plasmonic Electrochromic Materials for Dual-Band VIS-NIR Smart Labelling

Novel electronic components and devices need to constantly foster a high level of functionality and performance; they also have to be designed in a way that lowers material and energy consumption throughout the life-cycle and value chain, and facilitates recycling and waste management. This is particularly true for labelling devices, increasingly involved in applications such as intelligent packaging, environmental monitoring and disposable diagnostics. The present PECLABEL project will build upon a recently emerged smart labelling technology based on electrochromic materials, bearing a high scientific and economic potential for processing highly-efficient optically-commutable display devices. It will bring forward environment-friendly inks of metal-oxide-based plasmonic nanostructures for designing dual-band, VIS-NIR spectrally-selective surfaces and devices, standing as a new generation of robust, stable, performant and durable energy-saving electrochromic labelling systems.

PolyBioMat

Polylactide-based multifunctional materials

The PolyBioMat project will develop a Polylactide (PLA) with the use of additives, which will lead to the expansion of its range of applications. Currently, there is poor compatibility between matrix polymer and filler, resulting in significant degradation of mechanical properties with the use of multiple fillers. This challenge will be addressed and additional slow compostability. The aim is to produce and process novel and more cost-effective PLA-based materials with non-toxic compatibilizers and fillers from organic waste materials from agriculture. The functional properties are at the level of conventional technical PLA grades. The service life covers at least three processing cycles. The advantages are with a new, fully biodegradable PLA-based composite with good functional properties. In addition, fertilization properties are generated after biodegradation. Furthermore, new ways for material utilization of waste from agricultural production will be demonstrated.

REPLACER

Recycling plastic and developing hybrid living materials by capturing greenhouse gases to produce value-added products

Rationale: Climate change, plastic pollution, and food insecurity are existential threats and pose tremendous challenges to Europe and the world. Finding sustainable solutions are challenging. Objectives: The REPLACER project addresses these challenges by combining the advantages of the living and non-living worlds to develop hybrid living materials (HLMs) and enable sustainable production of feed proteins. Potential applications: Key applications include a new carbon capture and utilization (CCU) concept, HLM-based bioreactor prototypes from recycled PET, and microbial proteins produced from greenhouse gases (GHGs) as a source of animal feed. Impact and potential benefits: The commercialisation of the concept will contribute: a) capturing GHGs and supporting EU's GHG emission reduction targets, b) recycling plastic and supporting the European Green Deal and the Circular Economy Action Plan, c) producing microbial proteins and reducing EU’s dependency on soy protein import.

SAFER

Self-healing fiber ceramic matrix composite

SAFER aims to research and develop a family of non-oxide ceramic matrix composites (CMC) with self-healing abilities. Since monolithic ceramics are brittle, their application is rather limited. With embedded carbon fibres, ceramics behave more ductile and have a high temperature resistance. Within SAFER, this outstanding material is further functionalised with carbon nano structures, to enhance its mechanical properties as well as generate self-healing. The production is done in a large-scale injection moulding pro-cess followed by a pyrolysis and LSI process. Furthermore, recycled material should be fed back into the process, to reduce the CO2 footprint and production cost. The project will be monitored by LCA to deter-mine the impact on the environment and adapt the research if necessary. The fibre ceramic does not emit any fine dust in friction applications and as brake on a car it lasts its entire life. Besides, the material can be used in energy generation,e.g. in hydrogen engines.

SLAP

Stabilization of Lithium Metal Anodes with Porphyrin-based Electrolyte Additives

The goal of this project is to significantly advance the development of Lithium-Metal-batteries (LMBs). LMBs would provide significantly greater charge storage capacity than the currently leading Lithium-Ion-Battery Technology. However, their commercialization faces multiple obstacles in terms of safety and cycle life due to the formation of lithium metal dendrites on the anode surface. This project is concerned with suppressing dendrite formation with porphyrin-based additives to the electrolyte. In the course of this project, this known effect will be optimized, and the under-lying mechanism will be elucidated. Due to their higher specific energy content, safe LMBs would find immediate use in any of application where LIBs are currently used, e.g. in transportation and stationary power storage. The significance of this strategy lies in the fact that it could be readily adapted for large scale production. This would significantly curtail the implementation period for this technology.

SoftCompEl

Soft Magnetic Composites for Advanced Electrification

Sustainability is a strong driver for electrical machines with smaller size and higher efficiency. Design flexibility of electrical machines is much higher with soft magnetic composites (SMCs) providing isotropic magnetic flux in contrast to conventional laminated steel sheets. In this project SoftCompEl the potential of more efficient innovative electrical machines with higher power density shall be exploited by customized development of high performance soft magnetic composites for axial flux machines (AFM) and active magnetic bearings (AMB) in flywheels. High speeds of these applications result in tremendous demands regarding magnetic and mechanical properties on the SMC components. This is a great challenge in material design effecting component design. A consortium from renowned research institutes and future-oriented companies will combine all necessary expertise to develop and demonstrate the potential of high performance soft magnetic composites in two different applications.

STEEP UP

Steep absorption with supramolecular self-assembled functional dyes for vacuum-deposited organic solar cells

Since Heliatek’s start of volume production in 2022, vacuum processed Organic PhotoVoltaics (OPV) is a new way to produce PV, for use on roofs and facades. OPV is independent of imports from critical origin. It uses no rare metals, toxic substances, or solvents. Low temperature processing leads to short energy payback time. Yet, there is a requirement to increase efficiency to better compete with other PV technologies. STEEP UP aims for increased cell efficiency by reduced voltage loss, energetic alignment and steepness of the absorption spectra. Focus is on evaporable absorbers: indolo[1,2-a]indol-3-ones, diketopyrrolopyrroles, and structurally blocked oligomers. Special emphasis will be put on simple structure, scalability and stability of the materials. Aim is 1%

efficiency increase in OPV, and 20 years lifetime. This little increase generates a big impact: Converting a 10% Heliatek product to 11%, generates additional 10 MWp electrical power annually, corresponding to 20 M€ value.

STELLAR

Surface Texturing with Laser for Large Areas with Riblets

Rationale / Needs to be addressed: To provide a clean, flexible, environmentally friendly and energy-efficient surface profiling technology by using lasers for Riblet mass production reducing drag on technical surfaces. Objectives: To demonstrate that shark skin inspired Riblet-shaped surfaces improve the energy efficiency of rotating and traverse flow applications by high-speed laser engraving and by plastic replication of laser-made inverse Riblets. Potential applications: Riblets are laser engraved on pipes and propellers and tested under op-erational conditions. This stimulates innovations for energy savings & clean energy production e.g., in energy machinery sector supporting EU Green Deal & UN SDGs. Impact and potential benefits: Besides technological/ functional performance improvements, positive societal impact for economic growth, employment & life quality is provided. Synergies between industry and academia arise, the IAB reaches stakeholder community, and assures tech transfer.

SustainFibresFCM

Development of sustainable fibre-based food packaging materials made from agricultural residues using safety-by-design

Rationale/ Needs: The SUPD urges to reduce single-use plastic and replace it with sustainable alternatives. Recycled paper contains critical substances for food contact, thus novel, safe and recyclable fibre packaging materials are needed. Objectives: The project aims to upcycle fibre-based agricultural waste for packaging applications using a chemical free steam explosion technology. A new safety-by-design concept secures that the material is compliant with EU regulations for FCM. The sustainability-by-design ensures the sustainability of the whole value chain. Application: The agricultural harvesting residue pulps will be used to produce innovative food packaging, with ready to eat food packaging as prototypes. Impact and benefits: With the reuse of agricultural waste and its new application in direct food contact, the sustainable fibre material will provide demanded solutions for agricultural harvesting suppliers, the packaging industry, local retailers, consumers and the EU.

TBC4H2

Thermal Barrier Coatings for greener heat-to-power applications: understanding limits of operation under hydrogen combustion and sustainable outlook

Increasing the efficiency and lowering the CO2 and NOx emissions of aircraft and industrial turbines requires raising their operational temperature which is currently limited by the materials used for their components. The application of hydrogen-based fuels will contribute to new degradation modes of materials related to water vapor presence in the exhaust gases. The goal of the project is to gain new knowledge on the high temperature behavior of TBCs on Ni-based superalloys for turbines components operating at temperatures beyond the capabilities of currently used materials (1200 °C) and under water vapor atmospheres (hydrogen combustion). The results of the project will strengthen the development of technologies applied in aviation and power generation for protection against high temperature of turbine blades operating under harsh environments. The project is in line with the Green Deal policy assuming a significant reduction of CO2 emissions by the transport sector by 2050.

TOP-Crete

Novel bendable thermoplastic rebars for improved durability and sustainability of concrete structures

Rationale / Needs to be addressed: Novel and recyclable composite reinforcement is needed to design and build highly durable structures with high mechanical performance and a longer service life, as well as to reduce the current high cost of corrosion and contribute to sustainability and circular economy. Objectives: Development of a bendable, durable and recyclable embedded thermoplastic (TP) fibre reinforced polymer (FRP) reinforcement for a new concept of highly durable and high-performance reinforced concrete (RC) structures. Potential applications: Structural application of TP FRP reinforcement in concrete structures. Impact and potential benefits: Optimization of TP FRP composition and production process, and development of recycling approaches, demonstration of their structural use and development of design guidelines for TP FRP RC structures. Significant savings in production with less primary materials and a change in the supply chain model.

TRANSITION

Transforming waste into high-performance 3D printable cementitious composite

Rationale: To make extrusion 3D concrete printing a viable construction technology, its environmental footprint needs to be reduced. Thus, formulations with alternative supplementary cementitious materials need to be developed. Objective: A pre-blended dry product is formulated with a large proportion of oil shale ash. When mixed with water, it forms a high-performance cementitious composite for 3D printing of full-scale structural elements. Collision milling and high-frequency ultrasonic dispersion are employed to manipulate composite properties and induce the setting of the filament. Potential applications: The pre-blended dry product can be used with a variety of extrusion printers to fabricate structural elements with the required mechanical resistance and durability. Impact and potential benefit: Easy-to-use pre-blended dry product has the potential to boost the implementation of 3D printing in construction while at the same time reutilising the waste from oil shale power plants.

Wood-wastePanels

Wood waste containing composites for high performance nearly zero energy building panels

The project's objective is a novel manufacturing technology of building products – multi-layered panels – made of high-performance natural fiber composites, which will be developed using production wood wool cement board (WWCB) waste from project partner CEWOOD Ltd, as well as construction demolition waste of WWCB. These panels will be cost-effective and have high hygro-thermal properties, which will give them the advantage of being used as enclosures and thermal insulation for buildings, including passive and nearly zero energy buildings (NZEB). The main benefits of the proposed building products are a rational use of local resources and sustainability, as significant CO2 savings can be achieved by avoiding bio-fibers material landfilling and encapsulating it in new materials. They will also be energy-efficient, ecological, easy to recycle, and with low energy intensity. WWCB recycling methods will also include binder re-activation and separation of wood wool for secondary use.