M-ERA.NET Call 2023:
List of projects recommended for funding

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Sustainable advanced materials for energy	ANGSTROM	Advancing Supercapacitors with Plasma-designed Multifunctional Hybrid Materials	4	Agencia Estatal Consejo Superior de Investigaciones Científicas (ES) Institut "Jožef Stefan" (SI) Central European Institute of Technology (CZ) IQS nano (CZ)	AEI (Spain) MVZI (Slovenia) TACR (Czech Republic)
Sustainable advanced materials for energy	ArcAMAT	Advanced materials engineering for arc plasma-assisted production of hydrogen-containing syngas for clean energy utilization	4	Technical University Bergakademie Freiberg (DE) AGH University of Krakow (PL) Technical University of Denmark (DK) DBI-Virtuhcon GmbH (DE)	SMWK (Germany) NCN (Poland) IFD (Denmark)
Sustainable advanced materials for energy	COBRA	Calcium Organic BatteRy Alliance	6	Université catholique de Louvain (BE) National Institute of Chemistry (SL) AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS (ES) NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE FOR CRYOGENICS AND ISOTOPIC TECHNOLOGIES (RO) CHALMERS TEKNISKA HOEGSKOLA AB (SE) AB Libergreen (SE)	FNRS (Belgium) MVZI (Slovenia) AEI (Spain) UEFISCDI (Romania) VINNOVA (Sweden)
Sustainable advanced materials for energy	CoLi-SCo	Multiscale Coupling of Lithium-Sulphur Battery Compounds from Carbon Pores to Full Cells	7	Friedrich-Schiller-University Jena (DE) Helmholtz-Zentrum Berlin (DE) Poznan University of Technology (PL) Agencia Estatal Consejo Superior de Investigaciones Científicas (ES) Lukasiewicz Research Network (PL) INNOVATOR Sp. z o.o. (PL) Orion (DE)	JÜLICH (Germany) NCBiR (Poland) AEI (Spain)

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

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Sustainable advanced materials for energy	FUNCY-SSB	FUNctional Coatings of sulfide electrolYtes for lithium Solid-State Batteries	6	Fraunhofer Institute for Silicate Research (DE) University of Oslo (NO) National Institute of Chemistry (SL) cylib GmbH (DE) EurA AG (DE) Morrow Batteries (NO)	JÜLICH (DE) RCN (Norway) MVZI (Slovenia)
Sustainable advanced materials for energy	H2-ELECTRODE	High-efficient electrodes for alkaline electrolysis based on electroplating combined with pulsed laser ablation and ex situ sulfiding	4	Advanced Surface Plating ApS (DK) HydrogenPro ASA (NO) Seldeon Oy (FI) Aarhus University (DK)	IFD (Denmark) RCN (Norway) BF (Finland)
Sustainable advanced materials for energy	HEROES	Hydrogen Conversion Enhancement for PEMFC through Innovative Design in Materials and Membrane-Electrode-Assembly	5	AIT Austrian Institute of Technology GmbH (AT) IAG Industrie Automatisierungs GMBH (AT) Centre National De La Recherche Scientifique (FR) Korea Institute of Energy Research (KR) KORENS RTX (KR)	FFG-MdZ (Austria) ANR (France) KIAT (South Korea)
Sustainable advanced materials for energy	HESSENSE	Light Weight High Entropy Alloys for Safe and Sustainable Energy Storage	6	Institute for Energy Technology (NO) CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) University of Warsaw (PL) HYSTORSYS AS (NO) *Università degli Studi di Torino*	RCN (Norway) ANR (France) NCN (Poland)
Sustainable advanced materials for energy	HYPHAD	Machine Learning-Assisted Design of Metal Hydride Alloys for Hydrogen Applications using CALPHAD Predictive Modelling	4	Korea Institute of Energy Technology (KR) Fraunhofer IFAM (DE) AGH University of Krakow (PL) Wonil T&I Co., Ltd (KR)	c SMWK (Germany) NCN (Poland)
Sustainable advanced materials for energy	INDYE	INdoor photovoltaics with DYE-sensitized solar cells	4	UNIVERSIDAD PABLO DE OLAVIDE DE SEVILLA (ES) COMMISSARIAT Á L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (FR) Dyenamo AB (SE) Uppsala Universiteit (SE)	AEI (Spain) ANR (France) VINNOVA (Sweden)
Sustainable advanced materials for energy	LIB2SIB	Development of innovative, low-cost $NaFePO_4$-type Sodium-Ion-Batteries based on recovery of $LiFePO_4$-material from spent Lithium-Ion-Batteries	5	Research Institute for Precious Metals + Metals Chemistry (fem) (DE) Niocycle Teknoloji San. Tic. A.S. (TR) Sakarya University (TR) Bulgarian Academy of Sciences (BG) EurA AG (DE)	JÜLICH (DE) TUBITAK (Turkey) BNSF (Bulgaria)

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Sustainable advanced materials for energy	Low-MACER	Low-dimensional MAgnetoCalorics for Efficient Refrigeration	3	Universidad Complutense de Madrid (ES) Leipzig University (DE) Centre National de la Recherche Sientifique (FR)	AEI (Spain) SMWK (Germany) ANR (France)
Sustainable advanced materials for energy	Na-CerAnode	Ceramic Anode Host Material for Confined Sodium Plating	4	Fraunhofer Institute for Ceramic Technology and Systems IKTS (DE) Centre for advanced materials application SAS (SK) Universidade Federal de São Carlos (BR)	SMWK (Germany) SAS (Slovakia) FAPESP (Brazil)
Sustainable advanced materials for energy	NEXPECH2	Next generation photoelectrochemical cell for hydrogen generation	5	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) SINTEF (NO) Universidad de Oviedo (ES) Institut Català de Nanociència i Nanotecnologia (ES) Multidesign engineering AS (NO)	ANR (France) RCN (Norway) AEI (Spain)
Sustainable advanced materials for energy	SusHiBatt	Sustainable High-Voltage Batteries Based on Hybrid Cathodes Enabling Dual-Ion Energy Storage	4	Fraunhofer IKTS (DE) Warsaw University of Technology (PL) Centre for Advanced Materials Application (SK) Complutense University of Madrid (ES)	SMWK (Germany) NCN (Poland) SAS (Slovakia) AEI (Spain)
Innovative surfaces, coatings and interfaces	3Interfaces	Optimization of Interfaces in Quasi-solid state Lithium Metal Batteries	4	Università della Calabria (IT) AIT Austrian Institute of Technology GmbH (AT) University of Oulu (FI) Lithoz GmbH (AT)	CALABRIA (Itay) FFG-PdZ (Austria) AKA (Finland)
Innovative surfaces, coatings and interfaces	GELWIN	Smart window based on surface-active thermally responsive hydrogel	3	University of Tartu (EE) Leibniz Institute of Polymer Research Dresden (DE) Riga Technical University (LV)	ETAG (Estonia) SMWK (Germany) LZP (Latvia)
Innovative surfaces, coatings and interfaces	KIDmicroBLOOD pump	Miniaturization of impeller pump as minimal invasive implanted mechanical heart assist for children & teenagers	6	Polish Academy of Sciences (PL) Religa Foundation of Cardiac Surgery Development (PL) JOANNEUM RESEARCH Forschungsges.m.b.H. (AT) DISTECH (AT) Kocaeli University (TR) Fabryka Narzędzi Medycznych CHIRMED Marcin Dyner (PL)	NCBiR (Poland) FFG-PdZ (Austria) TUBITAK (Turkey)

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Innovative surfaces, coatings and interfaces	PlasmaCoLa	Plasma Coatings as Sustainable-by-Design Adhesion Primers in Multi-Material Laminates	5	Luxembourg Institute of Science and Technology (LU) POLYKEY (ES) POLYMAT University of the Basque Country (ES) EFFITECH SARL (FR) UNIVERSITE DE PAU ET DES PAYS DE L'ADOUR (FR)	FNR (Luxembourg) EJ-GV/Innobasque (Spain) AEI (Spain) RNAQ (France)
Innovative surfaces, coatings and interfaces	PoRaCoat	Innovative stent coating with polyphenol-rapamycin complex with improved drug-eluting properties to target in-stent-restenosis	5	University POLITEHNICA of Bucharest (RO) Gdansk University of Technology (PL) Balton sp. z o.o. (PL) Fraunhofer Institute for Ceramic Technologies and Systems IKTS (DE) University Hospital "Carl Gustav Carus" and Medical Faculty of the TU Dresden (DE)	UEFISCDI (Romania) NCBiR (Poland) SMWK (Germany)
Innovative surfaces, coatings and interfaces	ULTRADRY	Unlocking the potential of sustainable and solvent-free fabrication of electrodes for Li-ion battery cells	4	SINTEF AS (NO) IREC (ES) Warsaw University of Technology (PL) Beyonder (NO)	RCN (Norway) AEI (Spain) NCN (Poland)
High performance composites	FutureMold	Flexible manufacturing approach for recyclable bio-based high performance composite molds	5	Fraunhofer-Institut für Werkzeugmaschinen und Umformtechnik (DE) IT4I@VSB (CZ) SVS FEM s.r.o. (CZ) Adam Mickiewicz University (PL) STER (PL)	SMWK (Germany) TACR (Czech Republic) NCBiR (Poland)
High performance composites	OPTIPUL	Optimizing and Controlling Variable Cross-Section Pultrusion for High-Performance Composite Materials	4	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (DE) Technische Universität Chemnitz (DE) FORD OTOMOTIV SANAYI ANONIM SIRKETI (TR) Luxembourg Institute of Science & Technology (LU)	SMWK (Germany) TUBITAK (Turkey) FNR (Luxembourg)
High performance composites	SHAPE	Sustainable High performance functionally graded composites via. Advanced manufacturing of Particle-reinforced Cu/SiC for Electrical applications	4	Professorship of Composites and Material Compounds (DE) Karadeniz Technical University (TR) Cracow University of Technology (PL) ATMAT Sp. z o.o. (PL)	SMWK (Germany) TUBITAK (Turkey) NCBiR (Poland)

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High performance composites	SMARTCAP	Smart rumen composites for metabolic diseases	7	National Research and Development Institute for Textile and Leather (RO) National Institute for Research & Development in Chemistry and Petrochemistry (RO) Mustafa Kemal University (TR) Korea Institute of Ceramic Engineering and Technology (KR) ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY (KR) Yüzüncü Yıl University (TR) HANONG Co.,Ltd. (KR)	UEFISCDI (Romania) TUBITAK (Turkey) KIAT (South Korea)
High performance composites	ULMAN	Ultimate composites for smart mechanical sealing with advanced nanocomposites	6	University of Oulu (FI) Chang Gung University (TW) Tampereen Tiivisteteollisuus Oy (FI) iProtoxi (FI) Reakciókinetikai és Felületkémiai Kutatócsoport (HU) HK-Ceram Kft (HU)	BF (Finland) Taiwan (TW) NKFIH (Hungary)
Functional materials	2D4PFAS	2D materials for electrochemical PFAS removal from water	5	Technische Universität Dresden (DE) Politechnika Warszawska (PL) Helmholtz-Zentrum für Umweltforschung (DE) PARTIKAS DROSIBAS, DZIVNIEKU VESELIBAS UN VIDES ZINATNISKAIS INSTITUTSBIOR (LV) ADJ Nanotechnology (PL)	SMWK (Germany) NCBiR (Poland) LZP (Latvia)
Functional materials	BAPUR	Fully Bio-based Advanced Filtration Systems for Removal of Emerging Pollutants from Water	5	University of Cantabria (ES) University of Tomas Bata (CZ) University of Ljubljana (SI) Latvian State Institute of Wood Chemistry (LV) Abo Akademi University (FI)	AEI (Spain) TACR (Czech Republic) MVZI (Slovenia) LZP (Latvia) AKA (Finland)
Functional materials	CERMETAD	Ceramic embedded Metamaterials for Microwave Application Devices	4	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (FR) Technical University of Denmark (DK) ATLANT 3D NANOSYSTEMS APS (DK) Fraunhofer Institute for Ceramic Technologies and Systems (DE)	ANR (France) IFD (Denmark) SMWK (Germany)

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Functional materials	CleanLake	Development of water treatment systems that counteract the eutrophication process of lakes based on zeolites obtained from industrial by-products	5	Cracow University of Technology (PL) Adam Mickiewicz University in Poznan (PL) PROTE Technologie dla Środowiska Sp. z o.o. (PL) Technische Universität Bergakademie Freiberg (DE) Vilnius Gediminas Technical University (LT)	NCBiR (Poland) SMWK (Germany) LMT (Lithuania)
Functional materials	GasSensingMat-RT	New gas sensing materials with working temperature close to or at room temperature	6	INSTITUTUL NATIONAL DE CERCETARE DEZVOLTARE PENTRU FIZICA MATERIALELOR (RO) INSTITUTUL NATIONAL DE CERCETARE DEZVOLTARE PENTRU FIZICA LASERILOR PLASMEI SI RADIATIEI (RO) S.C. Caloris Group S.A. (RO) DEBRECENI EGYETEM (HU) ATATURK UNIVERSITY (TR) Nanomanyetik Bilimsel Cihazlar Ltd.Sti (TR)	UEFISCDi (Romania) NKFIH (Hungary) TUBITAK (Turkey)
Functional materials	ISIMON	IN-situ structural health monitoring of functional composite structures by truly-integrated carbon nanomaterial-based sensors	5	TECHNISCHE UNIVERSITAET CHEMNITZ (DE) RIGAS TEHNISKA UNIVERSITATE (LV) RISE RESEARCH INSTITUTES OF SWEDEN (SE) LINKOPINGS UNIVERSITET (SE) COMPOSITE SERVICE EUROPE AB (SE)	SMWK (Germany) LZP (Latvia) VINNOVA (Sweden)
Functional materials	LivMat	Productive catalytic living materials: combining 3D biobased fibrillar membranes with synthetic microbial consortia to produce chemicals	6	Leipzig University (DE) Helmholtz-Zentrum für Umweltforschung GmbH (DE) Solaga UG (DE) Istanbul Technical University (TR) Kaunas University of Technology (LV) University of Latvia (LV)	SMWK (Germany) TUBITAK (Turkey) LMT (Latvia) LZP (Latvia)
Functional materials	POR-BioSorb	POROus Bio-based and high-functional sorbent alternatives	7	KTH Royal Institute of Technology (SE) Spanish National Research Council (ES) Universidad de Castilla-La Mancha (ES) Tetis Biotech (TR) Swedish Environmental Institute (SE) BioExtrax (SE) MedClair (SE)	VINNOVA (Sweden) AEI (Spain) TUBITAK (Turkey)

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Functional materials	STF4SW	Sustainable Act for Construction Market: A new perspective on passive seismic protection	5	Kalekim Kimyevi Maddeler San. Ve Tic. A.Ş (TR) UNIVERZITA PARDUBICE (CZ) Czech Technical University in Prague (CZ) CERVENKA CONSULTING SRO (CZ) Technical University of Cluj-Napoca (RO)	TUBITAK (Turkey) TACR (Czech Republic) UEFISCDI (Romania)
Functional materials	TexPie	Textured lead-free piezoceramic materials by additive manufacturing for high-performance ultrasonic transducers	5	Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung e.V. (DE) Meinhardt Ultrasonics (DE) Lithoz GmbH (AT) Korea Institute of Material Science (KR) HassBio (KR)	SMWK (Germany) FFG-PdZ (Austria) KIAT (South Korea)
Advanced materials and technologies for health applications	AntiMicroMXen	Electrospun scaffolds with antimicrobial and wound-healing capabilities utilizing bacteriophages, mesenchymal stem cell–derived factors and MXenes	4	Hirszfeld Institute of Immunology and Experimental Therapy (PL) Fraunhofer Institute for Ceramic Technologies and Systems (DE) University of Latvia (LV) NANOCARBONTECH (PL)	NCN (Poland) SMWK (Germany) LZP (Latvia)
Advanced materials and technologies for health applications	BioIMplant	Novel biodegradable biopolymer-Bioglass-composite implant technology	3	Leibniz-Institut für Polymerforschung Dresden e. V. (DE) National Taiwan University of Science and Technology (TW) Polymer Institute, Slovak Academy of Sciences (SK)	SMWK (Germany) NSTC (Taiwan) SAS (Slovakia)
Advanced materials and technologies for health applications	Cellu4Heal	Advanced degradable nanocellulose-based matrix for stem cell differentiation and burn wound healing	5	UNIVERSITETET I BERGEN (NO) RISE PFI AS (NO) Alginor Biorefinery AS (NO) University Politehnica Bucharest (RO) University of Helsinki (FI)	RCN (Norway) UEFISCDI (Romania) AKA (Finland)
Advanced materials and technologies for health applications	ROSSCA	ROS-Scavenging Magnetic Nanozymes with Remote Activation for Alzheimer Disease	4	UNIVERSIDAD DE ZARAGOZA (ES) NACIONALNI INSTITUT ZA BIOLOGIJO (SI) UNIVERSIDADE DE SAO PAULO (BR) Maj Institute of Pharmacology Polish Academy of Sciences (PL)	AEI (Spain) MVZI (Slovenia) FAPESP (Brazil) NCN (Poland)
Advanced materials and technologies for health applications	SMARTGEL	Smart nanogels of bio-based antimicrobials to prevent urinary tract infections by disrupting inter- and intra-species communication of pathogens	5	Universitat Politecnica de Catalunya (ES) Dunarea de Jos University of Galati (RO) Sofia University (BG) Medical University of Bialystok (PL) Azrieli College of Engineering in Jerusalem (IL)	AEI (Spain) UEFISCDI (Romania) BNSF (Bulgaria) MOST IL (Israel)

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Next generation materials for advanced electronics	DURATRANS	Sustainable and Highly Durable Nanowire-Based Flexible Transparent Conductive Surfaces for Advanced Electronics	4	University of Turku (FI) Tampere University (FI) DigInnoCent s.r.o. (CZ) University of Zagreb (HR)	AKA (Finland) TACR (Czech Republic) MZO (Croatia)
Next generation materials for advanced electronics	INORIN	Optically addressed high-speed inorganic-organic interface for advanced optical and terahertz photonics	4	Military University of Technology (PL) Warsaw University of Technology (PL) Riga Technical University (LV) University of Lille (FR)	NCN (Poland) LZP (Latvia) ANR (France)

Publishable abstract of the projects:

2D4PFAS

2D materials for electrochemical PFAS removal from water

2D4PFAS aims to revolutionize per- and polyfluoroalkyl substances (PFAS) removal from water, addressing global concerns by an Electro-Catch&Treat process with advanced 2D functional materials. PFAS, linked to health risks, led to EU restrictions, emphasizing the need for effective testing and treatment. Conventional methods like activated carbon adsorption have shortcomings. The project proposes novel electrode materials, like functionalized 2D Ti3C2-MXene and graphene, for enhanced PFAS removal and degradation. Challenges in removal by Electro-Catch and slow oxidation kinetics in Electro-Treat are tackled. 2D4PFAS integrates fundamental sciences, material science, and technology development, aligning with 'safe and sustainable by design' principles. Assessments include life cycle, techno-economic, and socio-economic analyses. Success will bolster innovation, contributing to sustainable water treatment processes. The project targets a prototype for real wastewater treatment (TRL 5).

3Interfaces

Optimization of Interfaces in Quasi-solid state Lithium Metal Batteries

The world is changing over to electric modes of transportation in hopes of reducing carbon emissions; their backbone, battery technologies, has become a hot topic of development. Optimization of Interfaces in Quasi-solid state Lithium Metal Batteries (3Interfaces) responds to the need for the development of a safe, novel, highly energy-efficient solid-state battery, based on cobalt-free cathode (LNMO), Li metal anode, and a safer quasi-solid electrolyte for application in electric vehicles. The general objective of 3Interfaces is to conduct a holistic study of the interactions between high-voltage cathode and hybrid electrolytes to develop interface modifications to overcome intrinsic limitations. The project also addresses a new low-cost synthesis (cobalt-free), an urgent problem calling for long-term independence from this critical raw material. 3Interfaces is built by a multidisciplinary and highly experienced consortium that covers material experts, modelling, and battery testing.

ANGSTROM

Advancing Supercapacitors with Plasma-designed Multifunctional Hybrid Materials

Current rechargeable energy storage devices face important drawbacks, including long-term raw materials availability, life cycle, high prices and safety issues. Due to their fast discharge capabilities and long-term life cycle, supercapacitors are potential candidates for future energy storage. However, supercapacitors

need to overcome technical problems with designing electrodes and electrolytes, stability, energy density and attaining industry standards. ANGSTROM proposes an environmentally friendly plasma-enabled approach for developing advanced materials for supercapacitors, comprising vertical nanocarbons and highly porous active materials, the latter consisting of covalent organic frameworks or a new type of “a la carte” conformal porous metal oxides. The multidisciplinary and ambitious methodology and unique expertise will make it possible to surpass the state-of-the-art supercapacitors with superior capacitive storage, high energy density and potential for reusability.

AntiMicroMXen

Electrospun scaffolds with antimicrobial and wound-healing capabilities utilizing bacteriophages, mesenchymal stem cell–derived factors and MXenes

Despite the relative success of wound healing, still approximately around 10% of all wounds develop severe complications, this mainly refers to chronic and infected wounds. One of the most common and difficult to clear out pathogens found in the wounds is Methicillin-resistant Staphylococcus aureus (MRSA). The formation of chronic wounds escalates the risk associated with the prolonged hospitalization, multiple surgeries and can lead even to leg amputation. Therefore, an ideal wound dressing should provide a complex treatment which counteracts skin infections and promotes regeneration. The aim of AntiMicroMXen project is to develop a new generation of electrospun wound dressings integrated with bacteriophages against S. aureus and pro-regenerative factors derived from immortalized Human Adipose Tissue Mesenchymal Stem Cell (HATMSC) cells combined with antibacterial, hemostatic and reactive oxygen scavenging ability of MXenes.

ArcAMAT

Advanced materials engineering for arc plasma-assisted production of hydrogen-containing syngas for clean energy utilization

The energy-intense industries in Europe are facing major challenges due to the climate crisis and resource crisis and require the energy transition towards renewable energies and the raw material transition towards a sustainable circular economy. The ArcAMAT project addresses these challenges with innovative solutions to integrate renewable electricity with the chemical recycling of wastes, producing hydrogen-containing synthesis gas for the chemical industry. The main objective to be achieved is to develop and demonstrate a novel waste recycling process using arc plasma with steam as plasma-forming gas in combination with advanced 3D-structured plasma torch electrodes. The novel plasma torch electrodes to be developed in the project based on modelling and experiments in a 15 kg/h plasma gasifier will be characterised by higher process efficiency, better synthesis gas quality and a longer electrode lifetime compared to currently used electrodes.

BAPUR

Fully Bio-based Advanced Filtration Systems for Removal of Emerging Pollutants from Water

Rationale/Needs to be addressed: due to the increasing of emerging pollutants and regulations, the production of fully bio-based advanced filtration systems for removal of emerging pollutants from water is studied. Objectives: the use of waste biomass and low-impact processing, the functionalization of biomaterials towards emerging pollutants, new analytical techniques for micropollutants, and the 3-D production of the fully filtration systems at a TRL 6. An integral methodology based on techno-economic analysis by simulation, life cycle of assessment, and social issues will be used. Potential applications: Apart from new methods and techniques, the commercialization of the sustainable filtration systems. Some companies and government institutions are interested in. Impact and potential benefits: the prevention against the negative effects of anthropogenic activities and the increasing of the emerging pollutants. BAPUR project is related to the Sustainable Development Goals 3, 6 and 12.

BioIMplant

Novel biodegradable biopolymer-Bioglass-composite implant technology

In the treatment of bone-related diseases and fractures, surgical removal of osteosyntheses following bone healing is frequently required, resulting in further trauma, expense, and waste. BioImplant aims to eliminate such surgeries, while also aiding in the healing process of affected bones, by using novel composites that are metabolised and serve as slow-release sources of beneficial compounds for the production of osteosyntheses. The consortium of leading experts in polymer composites, compatibilisation and bioceramics, seeks to develop (TRL 2 to TRL 4) process-specific biopolymer/Bioglass composites with bifunctional compatabilisers/growth factors. Such development is crucial in light of Europe and Asia's ageing populations, necessitating heightened medical intervention. BioImplant seeks to address this need and thereby achieve significant social, scientific and commercial impacts. In doing so, valuable scientific insight and intellectual property will be developed and implemented.

Cellu4Heal

Advanced degradable nanocellulose-based matrix for stem cell differentiation and burn wound healing

Rationale / Needs to be addressed: Patients with severe, life-threatening burn injuries are at risk of long-term complications and morbidity due to their extensive wounds and prolonged healing. Recent developments in regenerative medicine hold the potential of using mesenchymal stem cells (MSC) for treating these wounds. Further, an optimal delivery system for MSC therapy is urged. Objectives: Our aim is to develop and validate a novel biodegradable matrix and delivery system for MSC in treating severe burn injuries. Potential applications: Cellu4Heal matrix holds the potential for shortening the healing time of burn wounds and reducing inflammation and scar formation, reducing the patient’s susceptibility to wound infections and complications. Impact and potential benefits: Cellu4Heal matrix can aid wound healing in severe burns and reduce the related mortality and morbidity, minimize the need for repeated surgeries, and consequently impact the quality of life for these patients.

CERMETAD

Ceramic embedded Metamaterials for Microwave Application Devices

The project aims to develop metamaterials, implemented as metasurfaces, to function as Reconfigurable Intelligent Surfaces (RISs). These metasurfaces will be controlled using light waves transmitted through optical waveguides on a substrate carrier. The absorption of light at the waveguides crossings generates heat to switch the phase changing materials (PCMs) in the unit-cells of the metasurface on or off. Simulation assisted metasurface design, PCM preparation, characterization, and deposition are part of the project. The RIS ability to tailor mm-waves will be evaluated through free-space measurements. Potential applications are in wireless communication, radar, sensing, and imaging requiring precise control of electromagnetic fields. Besides the demonstration of the technological potential, the project is expected to generate fundamental knowledge in wave-matter interactions taking place at the intersection of the fields of material science, optics and communication technologies.

CleanLake

Development of water treatment systems that counteract the eutrophication process of lakes based on zeolites obtained from industrial by-products

The project proposes an innovative water treatment systems. As part of the project, composite sorption materials based on zeolites obtained from by-products, i.e. fly ash and coal gangue, will be developed. The sorption material will be dedicated to the treatment of inland waters, in which the eutrophication process occurs in a form of products that prevent pollution from filtration the inflows or purification of the water. At the same time, designed elements will be possible for seasonal use, such as paths on the shore of the lake, nesting platforms for water birds or others. After absorbing the right amount of nitrogen and phosphorus compounds, the water infrastructure will be recycled and transformed into fertilizers for plant production with a controlled release rate of nutrients. The project has a scientific nature by creating products and developing modern technologies that are demanded by the market, and it is a dedicated to circular economy approach.

COBRA

Calcium Organic BatteRy Alliance

Low-cost, abundant raw materials and high energy are the key requirements for future battery technology supporting the realization of the European Green Deal. The current lithium-ion battery technology raises long-term concerns due to dependence on scarce metals and materials. There are many alternatives envisioned, often with their challenges proportional to their promises. Calcium battery is an alternative with extremely promising energy, power, and in particular environmental and sustainability metrics. Yet, this Holy Grail remains hard to attain given the complex nature of Ca behavior in a battery. COBRA’s objective is to make this a reality by developing CRM-free, high-energy density, rechargeable calcium metal-organic batteries reaching 350 Wh/kg at cell level. The application intended is residential mid- to large-scale energy storage, needed to ensure flexibility and security of the electrical grid, but also potentially appealing to electric transportation in the long term.

CoLi-SCo

Multiscale Coupling of Lithium-Sulphur Battery Compounds from Carbon Pores to Full Cells

The targets of the European Green Deal can only be reached if batteries with high specific energy and long lifetime based on abundant sources are brought to market. One promising candidate are lithium-sulphur batteries which were investigated on lab scale in recent years but broad implementation is still not achieved. The Major aim of CoLi-SCo is to support the practical implementation of Li-S batteries. It combines partners covering a range of different expertise, from fundamental research to industrial materials production. The batteries developed will be applicable in various applications such as mobile/stationary energy storage or electric mobility. CoLi-SCo follows a holistic approach and goes beyond investigation of structure-property relationships. Understanding for the interplay of different components in practically relevant lithium-sulphur cells will accelerate implementation of this technology which can positively impact the future quality of life.

DURATRANS

Sustainable and Highly Durable Nanowire-Based Flexible Transparent Conductive Surfaces for Advanced Electronics

DURATRANS addresses the pressing need for durable and stretchable transparent conductive surfaces (TCS) in the realm of flexible electronics. Current materials like ITO and conducting polymers face sustainability and conductivity challenges, while nanowires, though promising, often have limited lifespans and reduced transparency to conductivity ratio in films. Our key objectives include developing bioinspired TCS (BTCS) capable of >300% stretching, >4x increased shelf life, conductivity below 5 Ω Sq-1, and transparency exceeding 95%. We aim to achieve this by designing highly durable nanowires, incorporating biotic designs, developing novel nanoacoustic methods for microfabrication and conducting a comprehensive characterization process to realize highly durable BTCS. Life cycle assessment will be included to measure environmental impacts. To demonstrate the real-life applications, BTCS will be utilized in the fabrication of transparent e-skins and optoelectrochemical probes.

FUNCY-SSB

FUNctional Coatings of sulfide electrolYtes for lithium Solid-State Batteries

Rationale / Needs to be addressed: Sustainable and high-performance solid-state electrolytes (SSE) address a clear need in battery R&D. Objectives: FUNCY-SSB will develop sustainable by design SSEs with enhanced electrochemical performance. A synergistic combination of sulfide electrolytes and polymers as functional surface coatings will be used to fabricate SSEs. Semantic technologies for digitalising synthesis and manufacturing processes will improve interoperability and speed up the development. Recycling studies and economic/ecological potential analyses will address recyclability and sustainability of the SSEs. A pouch cell prototype will demonstrate the functionality of the FUNCY-SSB electrolyte. Potential applications: The advancements will enable solid-state Li-ion batteries for transportation. Impact and potential benefits: The results will impact the availability of components for future batteries. Advanced SSEs can improve EU competitiveness in the battery R&D landscape.

FutureMold

Flexible manufacturing approach for recyclable bio-based high performance composite molds

Rationale / Needs to be addressed: Currently, moulds are used to produce plastic and composite parts in small batches that require a high level of manufacturing effort. GRP molds in particular require a high level of maintenance and wear out after a certain number of molded parts, resulting in a high proportion of disposable material. As a result, the carbon footprint and cost of the manufactured part are largely determined by the mould design, up to 25% depending on volume. Objectives: The main objective of the planned project is to develop a novel, resource- and cost-efficient method for manufacturing molds for FRP technologies. Potential applications: Production of lightweight FRP components for rail, marine, aerospace and agricultural machinery. Impact and potential benefits: The FutureMold approach can significantly reduce the carbon footprint of mold and component manufacturing by completely eliminating disposable materials or the use of solid steel blocks. Through a novel recyclable composite mold, the contribution of the mold to CO2 emissions and costs will be reduced to less than 5%.

GasSensingMat-RT

New gas sensing materials with working temperature close to or at room temperature

GNeeds to be addressed: Classical commercial gas sensors have high operating temperatures, up to ~ 500 °C, making an electrical power supply necessary. Plug-in to the electrical grid or a large battery pack, present strong limitations for field applications. By room temperature operation of the sensing material, gas detector devices can be made hand-held portable with a long standalone working time.

GELWIN

Smart window based on surface-active thermally responsive hydrogel

Rationale/Needs to be addressed: An ideal type of smart window (SW) responds passively to the changing ambient temperature or light intensity, modulating solar energy flux through the windowpane, without requiring electrical energy input and expensive components. Thermally responsive polymers offer the potential to meet these requirements. Objectives: The development of SW based on thermally responsive hydrogel with stable performance, solar energy modulation of >70%, switching speed of ~1s and additional functionalities of switchable color through plasmon resonance and the use of novel photochromic nanoparticles. Potential applications: Energy-saving SWs for residential- and office buildings and for creating signs and logos that appear spontaneously in the warm state. Impact and potential benefits: SW technologies offer a great potential to improve energy efficiency of buildings, to reduce energy consumption and to increase occupant comfort.

H2-ELECTRODE

High-efficient electrodes for alkaline electrolysis based on electroplating combined with pulsed laser ablation and ex situ sulfiding

Rationale of the H2-ELECTRODE project is to significantly improve the efficiency of alkaline electrolysers, focusing on the enhancement of nickel foam electrodes. Objectives of the projects are to: Increase electrode efficiency by expanding and modifying the surface area of nickel as well as reduce the overpotential for H2 and O2 formation. The goal is to decrease OPEX for hydrogen formation by 4-6% beyond the existing 12-14% reduction achieved by ASP. Extend electrode life by 30-50%, minimising degradation from 0.13% to 0.09% per 1000 hours. Develop advanced manufacturing processes by utilising Pulsed Laser Deposition and ex situ sulfiding for efficient, large-scale electrode production. The technology will he applied in the new generation of alkaline electrolysers which will significantly boost the production of green H2 for energy storage applications. Impact and potential benefits are lowering emissions in H2 production and contributing to global sustainable energy goals.

HEROES

Hydrogen Conversion Enhancement for PEMFC through Innovative Design in Materials and Membrane-Electrode-Assembly

HEROES offers solutions to a clean energy transition through materials innovation in Proton Exchange Membrane Fuel Cells (PEMFCs) targeting medium/heavy duty vehicles (MHDVs) and power stationary applications. By addressing PEMFCs' low efficiency and high-cost issues, HEROES strives to develop a high performance-to-cost ratio PEMFCs capable of high-voltage and high-current density operations reaching up to 60% low heating value cell efficiency., HEROES will focus on reducing the critical materials by utilising low-PGM oxygen reduction reaction (ORR) catalysts, substituting the PGM-based ORR catalysts with more sustainable ones, enhancing ORR in PEMFCs by using novel co-catalyst, and reducing the graphitic bipolar plates (BPPs) materials budget through the development of the lightweight. The potential impact and benefit are high; up to 60 % PEMFCs low heating value efficiency, up to 30 % cell weight reduction, and 20 % more economical cell.

HESSENSE

Light Weight High Entropy Alloys for Safe and Sustainable Energy Storage

The utilization of light-weight materials for hydrogen storage are imperative in the green transition and to ensure safety, energy-efficiency, cost-effectiveness, and suitability in storing energy from intermittent renewable sources like wind and solar. HESSENSE aims to produce light-weight High Entropy Alloys (HEAs) that will operate as hydrogen-storage materials at near-ambient conditions with reversible gravimetric capacity above 2.5 wt.%. The feasibility of the concept will ultimately be demonstrated by the construction of a H2-storage prototype tank, with materials produced by HESSENSE. The aimed performance of the HEAs from HESSENSE will make then attractive for stationary energy storage and the heavy-duty transport sector. HESSENSE thus address EU's commitment to reach carbon neutrality by 2050 by facilitating the introduction of hydrogen in several key areas and hard-to-abate sectors such as maritime sector, heavy-duty transport, and their related infrastructure.

HYPHAD

Machine Learning-Assisted Design of Metal Hydride Alloys for Hydrogen Applications using CALPHAD Predictive Modelling

The HYPHAD project aims to exploit the recently developed universal machine learning potential in conjunction to CALPHAD, experiments, and large-scale synthesis to overcome the complex multi-scale nature of metal hydrides and rapidly screen diverse potential metal hydride materials for hydrogen applications. HYPHAD will address the needs of the industry partner in this proposal, namely, (1) discovering new metal hydrides to at least partially replace the costly and rare Ti, Zr and V elements of commercially used TiMn2 and FeTi and (2) finding economic, optimal alloying compositions for TiMn2 and FeTi. The proposed machine learning potential-based muti-scale discovery strategy is novel and broadly impactful to the materials science community. In addition to storage, hydrides can also be used for the compression and purification of hydrogen. The HYPHAD will contribute to Sustainable Development Goal 7 and the priority area of "Sustainable advanced materials for energy."

INDYE

INdoor photovoltaics with DYE-sensitized solar cells

The INDYE project targets the recycling of ambient light in domestic environments using photovoltaics (PV) and enabling the implementation of digital technologies such as Internet of Things (IoT). Our focus is advancing self-reliant and eco-friendly concepts to energize small indoor electric devices, eliminating the reliance on batteries. The main goal of INDYE is to take advantage of the versatility and good performance of the dye-sensitized solar cell concept in diffuse light to develop PV devices with improved optical match with artificial light sources and maximum voltage at low light. We will improve the environmental friendliness of indoor PV by using non-toxic materials. INDYE will foster integration of PV devices into the energy supply system in domestic and working spaces. A self-sustained and highly-connected IoT system will boost the development of novel hardware/software products while reducing electricity needs and electric waste, favouring the digital and green transition.

INORIN

Optically addressed high-speed inorganic-organic interface for advanced optical and terahertz photonics

The project focuses on the creation of a new type of fast hybrid liquid crystal (HLC) cells containing nano/micro-structured surfaces as an optically addressable primary component and the development of novel photonic and low-range terahertz (THz) tunable devices. The recent progress in signal transmission technology has made it necessary to develop a new type of high sensitivity device that is easy to set up, has fast response times and allows control of the signal. The optical devices based on liquid crystals (LCs) have demonstrated many advantages due to their large optical anisotropy and possibility of flexible controlling by thermal, electrical, optical, or magnetic field. The results of the project implementation could find application in fast signal processing. The obtained HLC cells with high birefringence will be tested in the optical and low-range THz regime for effective beam controlling.

ISIMON

IN-situ structural health monitoring of functional composite structures by truly-integrated carbon nanomaterial-based sensors

The ISIMON project aims at developing a novel self-sensing Fiber Reinforced Polymer (FRP) vessel for high-pressure fuel storage. This innovation addresses the critical need for monitoring both the fabrication process and the structural health of the vessel during its service life by integrating highly sensitive nano-composite (NC) based sensors into the FRPs during the winding process to enhance safety and performance in various industries. Advanced modeling, simulation, and machine learning techniques optimize the smart FRP vessel, reducing material usage by topological optimization. Experimental tests and machine learning algorithms for structural health monitoring validate the vessel's performance, potentially revolutionizing hydrogen fuel storage with cost-effective, real-time monitoring. Our project could lower maintenance costs, improve safety, and create new market opportunities to transform the landscape of high-pressure vessel technology for a sustainable and efficient future.

KIDmicroBLOODpump

Miniaturization of impeller pump as minimal invasive implanted mechanical heart assist for children & teenagers

Rationale / Needs to be addressed: Effective heart insufficiency treatment of kids & teenagers is pressing medical need to significantly decrease mortality during heart recovery or transplantation. Main demand is a miniaturised "artificial heart" (i.e. implantable blood pump, "ventricle assist device") for minimal invasive paediatric surgery. A simple miniaturisation of current "adult designs" strongly increases thrombogeneity risks. Objectives:R&D on advanced manufacturing for (i) smallest possible, blood-flow optimised design (by metal 3D printing), (ii) surface modification (mirror polish, fullerene & oligoproline films), (iii) implementation of on-device sensors (to monitor clotting) & (iv) removability ("de-flatability" of fixation stent) Potential applications: safest possible treatment for kids with heart insufficiency by extremely miniaturised VAD. Impact and potential benefits: Market introduction by FRK planned for 2032 after clinical trials & certification (MDR)

LIB2SIB

Development of innovative, low-cost NaFePO4-type Sodium-Ion-Batteries based on recovery of LiFePO4-material from spent Lithium-Ion-Batteries

The European Green Deal aims to transform the EU into a resource-efficient and competitive economy, achieving no net greenhouse gas emissions by 2050 and economic growth decoupled from resource consumption. Lithium-ion batteries (LIBs) are set to become one of the world´s most important green energy storage technology, widely used in mobile and stationary applications. The ever-growing market of LIBs to meet the demand for such applications raises concerns regarding the depletion of limited Li resources. Among all proposed alternative concepts, sodium-ion batteries (SIBs) have the greatest potential as the underlying chemistry of SIBs resembles that of LIBs while benefiting from abundant Na resources (ca. 440 times more abundant than Li). The aim of this project is to utilize spent LIBs to provide a breakthrough in the development of cheap, safe, stable and sustainable new generation of SIBs, thus reducing the price and enabling new paths to circular economy and life-cycle-assessment.

LivMat

Productive catalytic living materials: combining 3D biobased fibrillar membranes with synthetic microbial consortia to produce chemicals

Rationale: The global chemical systems are primarily linear, fossil-dependent, and emissions-intensive. Finding sustainable solutions to produce chemicals using a circular (bio)economy is ambitious but necessary for a sustainable future. Objectives: The main objective of the LivMat project is to capture and utilize natural resources (e.g., natural fibers) and waste resources (e.g., CO2) for developing catalytic living materials (cat-LMs) that are robust, energy-efficient, and scalable for chemical production. Potential applications: LivMat develops a synthetic microbial consortium reliant on natural and waste resources and constructs cat-LMs-based bioreactor prototypes for continuous monomer production. Impact and potential benefits: The commercialisation of the LivMat concept will capture CO2 and support the EU's GHG emission reduction targets. Developing bioreactor prototypes for continuous chemical production supports the European Green Deal and the Circular Economy Action Plan.

Low-MACER

Low-dimensional MAgnetoCalorics for Efficient Refrigeration

Rationale: Cryogenic cooling is key for many applications, as medical sensing, quantum technologies or H2 liquefaction. It relies on gas compression (inefficient, costly, and maybe harmful). Magnetic refrigeration is a powerful alternative. Objectives: Low-MACER will exploit the magnetocaloric effect (MCE) to store/release a large entropy by scanning a magnetic field. Low-dimensional and metamagnetic materials will boost the MCE in the desired temperature range using low fields. Potential applications: Combining theory and experiment, we will prepare new MC materials for magnetic refrigeration and thermal storage. We will focus on the 20 K region, relevant to the H2 liquefaction in green-energy applications. Impact and potential benefits: Our new "sustainable advanced materials for energy" will have expected impact on the scientific (knowledge generation & dissemination), economic (refrigeration industry), social (health, energy market), and environmental (green energy) dimensions.

Na-CerAnode

Ceramic Anode Host Material for Confined Sodium Plating

Needs to be addressed: New battery technologies are needed that can be efficiently manufactured from abundant or recycled materials, have a long life, meet the performance requirements of the application and are designed to be viable and effectively recyclable. These technologies are essential to support global growth in the renewable energy sector. Objectives: To develop processes for a novel anode for sodium-ion batteries using a porous solid separator. Improve the performance of the anode by depositing ALD layers within the porosity and applying advanced characterization technologies. Proof of feasibility in a demonstration cell. Potential applications: Sodium-ion batteries for stationary energy storage, and small cost-effective electric vehicles. Impact and potential benefits: Improve ecological impact of sodium-ion batteries by applying the new anode concept. Developed novel processes for next-gen batteries are of interest for engineering industry or battery cell manufacturers.

NEXPECH2

Next generation photoelectrochemical cell for hydrogen generation

Achieving effective reduction in greenhouse emissions necessitates both preventing resource depletion and offering sustainable solutions to meet the increasing demand for energy.The technology developed in the NEXPECH2 project effectively addresses the above-mentioned challenges by using solar energy to convert water to green hydrogen (H2) under standard atmospheric temperature and pressure. Green hydrogen is a clean, sustainable chemical fuel that can be stored on a large scale for a long time and used to replace fossil fuels as a means of energy storage, transportation fuel, and feedstock. The NEXPECH2 ultimate goal is to deliver green H2 on a prototype lab-scale via development of a innovative photoelectrochemical (PEC) system for maximized solar light harvesting and efficient solar conversion to H2. The project will develop a low-cost compact device with an objective of reaching 10% solar-to-fuel efficiency and <10% degradation over 200 h operation.

OPTIPUL

Optimizing and Controlling Variable Cross-Section Pultrusion for High-Performance Composite Materials

The OPTIPUL Project addresses the pressing needs in the composite industry by focusing on customized variable cross-section hybrid composites (core/FRP) made of a pultruded fibre-reinforced polymer (FRP) composites over a pre-defined variable cross-section structural core. These hybrid composites offer flexibility but face challenges in die design, process optimization, and the adoption of eco-friendly thermoplastics resin. Traditional processes generate significant material waste, which variable composites can reduce, enhancing resource efficiency. The shift to advanced materials requires innovative techniques, while designing for recyclability and reusability aligns with sustainability goals. The project's objectives include process development, optimization, sustainability, and technology demonstration. Its potential applications span aerospace, automotive, and more, promising reduced waste, improved accuracy, efficiency, and sustainability, with potential for commercial viability.

PlasmaCoLa

Plasma Coatings as Sustainable-by-Design Adhesion Primers in Multi-Material Laminates

Rationale / Needs to be addressed: adhesion primers are of crucial interest for the multi-material laminates industry. Their use is critical and gives flexibility to the lamination process and product design. After the product’s end-of-life, all these production benefits impede product’s recycling. Objectives: development of sustainable-by-design adhesion primers and adherent artificial solid electrolyte interfaces to increase solid-state battery cyclability. Potential applications: plasma deposition of adhesion promoters based on products derived from the chemical upcycling of mixed plastic wastes. Conceived to provide an on-demand debonding interface, the primers aim at facilitating the end-of-life recycling of multilayered packaging. Impact and potential benefits: change to a circular economy model by promoting collaboration between local companies with similar objectives and contributing to the application of good practices and the use of resources.

PoRaCoat

Innovative stent coating with polyphenol-rapamycin complex with improved drug-eluting properties to target in-stent-restenosis

Peripheral artery disease is caused by atherosclerotic lesions while the most effective treatment is the placement of endovascular stents. In-stent-restenosis (ISR) remains the main clinical problem of the stent therapy. Aiming to overcome this challenge, PoRaCoat is faced to create an innovative stent coating based on conductive polymer matrix poly(3,4-ethylenedioxythiophene) (PEDOT) with additive of polyphenol-rapamycin complex on cobalt-chromium (Co-Cr) substrate with a stent-like outline (platform). Due to improved drug-eluting properties the proposed coating will help to target ISR simultaneously supporting the regeneration of endothelial cells and preventing the proliferation of smooth muscle cells. PoRaCoat will develop a coating with PEDOT/PRC by electrodeposition method. The coating will be characterized concerning degradation, biocompatibility and effects on cell functions. The technology will have a crucial impact on the treatment of patients with atherosclerotic disease.

POR-BioSorb

PORous Bio-based and high-functional sorbent alternatives

Porous polymers, pivotal in liquid and greenhouse gas encapsulation, traditionally rely on petroleum plastics and energy-intensive production. POR-BioSorb, a collaboration of European Universities, SMEs, and Research Institutes, aims to revolutionize this sector. By utilizing cost-effective polymers from biomass and employing advanced green technologies developed in the consortium, this project seeks to produce eco-friendly, functional, porous biomaterials. Emphasizing scalability and environmental validation, POR-BioSorb will transform food waste into versatile, plastic-free materials useful as disposable sanitary items and greenhouse gas remediation technologies. This approach aligns with circular economy principles and ensures safe disposal and degradation into harmless substances, marking a significant step towards sustainable practices. The project also opens for novel applications, proactively thinking around the best environmental biopolymer policies in a future Bio-Europe.

ROSSCA

ROS-Scavenging Magnetic Nanozymes with Remote Activation for Alzheimer Disease

This project proposes a new therapeutic strategy against Alzheimer’s disease (AD), a neurodegenerative condition that is the prevalent cause of dementia worldwide. We will develop a dual-function magnetically triggerable synthetic nanozyme designed for nanomechanical disruption of amyloid-beta (Aβ) / hyperphosphorylated tau deposits under low-frequency ac magnetic fields, while restoring redox equilibrium by mimicking specific ROS-scavenging antioxidant enzymes. The physical action on the Ab/Tau deposits will provide independence from the molecular specificities of current therapeutic drugs in AD, while the catalytic action could add a synergistic therapeutic effect. These nanozymes will be delivered with the final readiness level apt for preclinical trials, assessed for toxicological safety and neuroprotective efficacy in a rat model of AD. This therapy will be potentially transferrable to other neurodegenerative diseases of related etiology of toxic buildups of proteins.

SHAPE

Sustainable High performance functionally graded composites via. Advanced manufacturing of Particle-reinforced Cu/SiC for Electrical applications

With the extensive usage of electrical contact materials (ECM) in cutting-edge technologies like e-vehicles, renewable energy systems, etc., it is imperative to develop new materials with enhanced properties to mitigate key issues such as high contact resistance, low wear and corrosion resistance, local melting, cold welding, material transfer losses and their contribution to global warming through fossil fuel emissions. Thus, the primary objectives of SHAPE are to address these challenges by creating and validating novel, recyclable Cu/SiC-based MMC and FGC ECMs that meet essential performance criteria, including high electrical and thermal conductivity, improved wear and arc erosion resistance, cost-efficiency, and ease of production. The potential impacts of SHAPE extend to the development of sustainable ECMs via additive manufacturing, reducing energy losses in renewable systems, environmental sustainability through waste upcycling, and resource conservation via EOL-ECM recycling.

SMARTCAP

Smart rumen composites for metabolic diseases

Europe has to reduce greenhouse gases by 30% until 2030. SMARTCAP can be solution to solve metabolic diseases and greenhouse emissions following the specific objectives: a) identification of requirements and specifications for processing high performance composites as smart rumen capsules -TRL 2; b) to design and develop of smart capsule by valorization of natural resources - TRL 3; c) to characterize and evaluate the SMARTCAP capsules - TRL 3; d) to demonstrate and validate the green manufacturing processes and prototype in relevant environment - TRL 4; e) to facilitate successful exploitation of results and communication. The expected results are experimental models; reports on physicochemical/biological tests; prototype SMARTCAP capsules and Illite-Feed-Additive - IFA; patent applications – 2; published articles – 6; conferences – 20; workshops – 3; website. The SMARTCAP approach generates a new concept of development natural performance composite materials with smart properties.

SMARTGEL

Smart nanogels of bio-based antimicrobials to prevent urinary tract infections by disrupting inter- and intra-species communication of pathogens

Urinary catheters often lead to urinary tract infections (UTIs), which are responsible for increased mortality, and multi-billion euro public health economic burden. Most of the available at the market antibacterial coatings feature low durability and development of antimicrobial resistance. SMARTGEL will address the existing gaps to control catheter-associated UTIs by developing smart bio-based nanogels with antifouling, antibacterial and antibiofilm activities for coating of urinary catheters while maintaining the urinary tract physiological function in an inter- and transdisciplinary approach. SMARTGEL will adopt RRI principles to assess the impact of the materials on the society, considering the environmental, societal, cultural, ethical and the political dimension of the research. The dissemination and communication plan will ensure that SMARTGEL results reach the most relevant stakeholders. Automotive and construction sectors may also benefit from SMARTGEL outcomes.

STF4SW

Sustainable Act for Construction Market: A new perspective on passive seismic protection

The primary priorities for nations within seismic belts include earthquake resilient structures, strengthening of vulnerable structures, and the restoration of heavily and moderately damaged constructions. On a global scale, the impact of seismic activity reaches beyond the borders of the affected nation, impacting the entire world. Therefore, the project deals with the implementation of shear thickening fluid (STF) as a vibration-damping system (VDS) as a novel approach for earthquake-resilient structures. STF recently peaked attention in literature for shock/impact absorbing properties. Employing STF as a VDS for low-frequency events (i.e., earthquakes) can upgrade the performance of the structures in certain cases. STF4SW aims to achieve:-synthesising of STF, specifically PolyBoronSiloxane (PBS) that will work under low shear rates, -material characterization tests on STF and the application of STF as a vibration damping system (VDS) for real-time applications.

SusHiBatt

Sustainable High-Voltage Batteries Based on Hybrid Cathodes Enabling Dual-Ion Energy Storage

Currently, rechargeable Li-ion batteries (LIBs) dominate the battery market for mobile electronic devices and are considered the most promising option for electric vehicle (EV) operation and grid energy storage. However, tremendous efforts are still needed to improve energy and power density, fast-charging capability, and lifetime, as well as to reduce manufacturing costs. Dual-ion batteries (DIBs) are an auspicious alternative to LIBs, in which the cathode is replaced by anion intercalation materials (high-voltage up to 5.2 V), while the salt in the electrolyte provides both the cations and anions that are stored in the electrodes. Compared to LIBs, DIBs are particularly advantageous in terms of cycling stability, power-density, and environmental and cost aspects. The project aims to evaluate and demonstrate the new battery concept of DIB. The ALD-coating and the development of suitable electrolytes will reduce electrode and electrolyte degradation at high potentials, respectively.

TexPie

Textured lead-free piezoceramic materials by additive manufacturing for high-performance ultrasonic transducers

Piezoceramic materials change their shape and exert forces under electrical fields. They are essential in many industrial, medical and consumer applications. The most powerful and therefore most commonly used piezoceramic materials contain lead. Lead-free piezoceramic materials which are in line with the RoHS directive of the EU are known, but still have inferior properties and higher costs. The aim of the TexPie project is to improve their properties using texturing. Their applicability should be demonstrated in power ultrasonic applications. Additionally, the use of additive manufacturing for shaping of piezoceramic components avoids machining steps and thus hazardous waste. Near net-shape manufacturing and optimizing thermal processes will reduce energy consumption in thermal processes and machining effort to net-shape for piezo ceramic components with high complexity, thus supporting the future European circular and sustainable industry.

ULMAN

Ultimate composites for smart mechanical sealing with advanced nanocomposites

The ULMAN project addresses the need for advanced sealing technologies in industry, where existing methods lack real-time performance monitoring and efficient maintenance. Our objective is to create smart sealing solutions with enhanced mechanical, thermal, and electrical properties using electrically conductive composites. These innovations enable the seals to self-monitor and provide real-time health assessments, ensuring safer operation and timely maintenance across various industrial applications. The impact of ULMAN's technology will significantly reduce downtime and maintenance costs, offering a safer, more reliable, and cost-effective alternative to traditional sealing methods. This positions our partners to lead in a competitive €54 billion market, delivering substantial safety and sustainability benefits in industrial processes.

ULTRADRY

Unlocking the potential of sustainable and solvent-free fabrication of electrodes for Li-ion battery cells

Rationale / Needs to be addressed: Addressing climate change, Europe's Green Deal pledges a climate-neutral society by 2050. Herein, batteries that are more sustainable throughout their life cycle are key. Objectives: The overall objective of ULTRADRY is to contribute to achieving this, by developing the fundamental understanding necessary to unlock the potential of dry processing of Li-ion battery (LIB) electrodes and reducing the F-content in the binder and electrolyte. Potential applications: Although ULTRADRY is working in relatively low TRL (2-4), the developed technologies, if successful, have the potential to be readily implemented into European battery production. Impact and potential benefits: Dry processing of battery electrodes is estimated to give 47 % in energy savings and 10-15 % reduced cost for battery production compared to conventional wet slurry casting. It could also produce thicker electrodes with higher energy density and improved mechanical properties.