M-ERA.NET Call 2021:
List of projects recommended for funding

M-ERA.NET

Call topic	Acronym	Full Title	No. of Partner	Participants[1]	Funding organisations
Modeling for materials engineering and processing	LaserBATMAN	Multi-scale simulation of laser welding for optimal battery pack manufacturing	5	Resolvent (DK) University of Skövde (SE) Technical University of Denmark (DK) **Volvo Group Trucks Operations (SE)* **Aurobay Powertrain Engineering Sweden (SE)*	IFD (Denmark) VINNOVA (Sweden)
Modeling for materials engineering and processing	MEDIATE	Semantic-based Material Twin and Co-Simulation Platform for Solid Oxide Fuel Cells	4	LIST (LU) Technische Universität Dresden (DE) SINTEF (NO) Norwegian University Of Science and Technology (NO)	FNR (Luxemburg) SMWK (Germany) RCN (Norway)
Modeling for materials engineering and processing	ModEl-FuturE	Modelling Wear of Intrinsically Self-Healing Elastomers for Reduced Particle Emission and Improved Lifetime Performance in Future e-Mobility Concepts	4	Univerzita Tomáše Bati ve Zlíně (CZ) Technische Universität Dresden (DE) Laboratoire de Mécanique et d'Acoustique (FR) Leibniz-Institut für Polymerforschung Dresden e.V. (DE)	TACR (Czech Republic) SMWK (Germany) ANR (France)
Modeling for materials engineering and processing	NACAB	NAnoCarbon materials for sustainable Battery technology	4	Aalto University (Caro) (FI) Aalto University (Laurila) (FI) VTT Technical Research Centre of Finland (FI) University of Iceland (IS)	AKA (Finland) RANNIS (Iceland)
Modeling for materials engineering and processing	PHANTASTIC	PHysics- and dAta-driven multiscale modelling desigN of layered lead halide perovskiTe mAterials for Stable phoTovoltaICs	5	University of Mons (BE) University of Luxemburg (LU) INSA de Rennes (FR) Technical University Dresden (DE) Technion-Israel Institute of Technology (IL)	FNRS (Belgium) FNR (Luxemburg) ANR (France) SMWK (Germany) MOST IL (Israel)
Modeling for materials engineering and processing	PORMETALOMICS	Porous Metal Genomics for Tailoring Mechanical Properties of Light-weight 3D-Printed Architectures	3	IMDEA Materials Foundation (ES) Technion - Israel Institute of Technology (IL) Institute of Mathematics, Polish Academy of Sciences (PL)	AEI (Spain) MOST IL (Israel) NCN (Poland)

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

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Innovative surfaces, coatings and interfaces	ARISER	Large Area Magnetron Sputtered All-Solid-State Batteries with ALD Buffer Layers	5	Izmir Institute of Technology (TR) TEKNOMA Technological Material. Inc. (TR) KOC UNIVERSITY (TR) SIEC BADAWCZA LUKASIEWICZ - INSTYTUT MIKROELEKTRONIKI I FOTONIKI (PL) CENTRUM BADAN I ROZWOJU TECHNOLOGII DLA PRZEMYSLU SPOLKA AKCYJNA (PL)	TUBITAK (Turkey) NCBR (Poland)
Innovative surfaces, coatings and interfaces	BATMAN	Development of novel Li ion BATtery solid electrolyte separators based on Metal orgANic frameworks	5	Austrian Academy of Sciences (AT) University of Vienna (AT) Creonia Cells GmbH (AT) Institute of Macromolecular Chemistry (CZ) National Taiwan University (TW)	FFG-MdZ (Austrian) TACR (Czech Republic) MOST TW (Taiwan)
Innovative surfaces, coatings and interfaces	BattPor	Inline evaluation of Li-ion battery electrode porosity using machine learning algorithms	4	Fraunhofer Gesellschaft zur Förderung der angewandten Forschung E.V. (DE) Universität Innsbruck (AT) PhysTech Coating Technology GmbH (AT) Slovenska Akademia Vied (SK)	SMWK (Germany) FFG-MdZ (Austria) SAS (Slovakia)
Innovative surfaces, coatings and interfaces	GoFIB	Gallium Oxide Fabrication with Ion Beams	3	UNIVERSITETET I OSLO (NO) HELSINGIN YLIOPISTO (FI) HELMHOLTZ-ZENTRUM DRESDEN-ROSSENDORF EV (DE)	RCN (Norway) AKA (Finland) SMWK (Germany)
Innovative surfaces, coatings and interfaces	Gold-PAWS	Sustainable Production Process for High-Quality Gold-Plated Wires for Antennae	3	Luma Metall AB (SE) Materia Nova (BE) IONICS (BE)	VINNOVA (Sweden) SPW (Belgium)
Innovative surfaces, coatings and interfaces	GREEN-BAT	GRadient- and multi-matErial procEssing of Next-generation solid-state-lithium BAtteries using direct maTerial processing.	4	University of Turku (FI) University West (SE) LiFeSiZE (SE) Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS (DE)	AKA (Finland) VINNOVA (Sweden) SMWK (Germany)
Innovative surfaces, coatings and interfaces	Greenhouse-PV	Semi-transparent PV coatings for greenhouse application	4	National Taiwan University (TW) InfinityPV (DK) Gdańsk University of Technology (PL) Institute of Experimental Botany of the Czech Academy of Sciences (CZ)	MOST TW (Taiwan) IFD (Denmark) NCN (Poland) TACR (Czech Republic)

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Innovative surfaces, coatings and interfaces	HardCoat	Surface hardening and highly wear-resistant nanocomposite coatings for woodworking tools	4	Chemnitz University of Technology (DE) National Institute of Research and Development for Optoelectronics (RO) DRUGON International SRL (RO) Palacky University Olomouc (CZ)	SMWK (Germany) UEFISCDI (Romania) TACR (Czech Republic)
Innovative surfaces, coatings and interfaces	I4BAGS	Ion Implantation for Innovative Interface modifications in BAttery and Graphene-enabled Systems	4	Łukasiewicz Research Network - Institute of Microelectronics and Photonics (PL) QWED SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA (PL) Materia Nova R&D Center (BE) IONICS S.A. (BE)	NCBR (Poland) SPW (Belgium)
Innovative surfaces, coatings and interfaces	InsBIOration	Bio-inspired interfaces for the development of next generation degradable multi-phase materials	6	Leibniz-Institut für Polymerforschung Dresden e.V. (DE) Institut Charles Sadron (FR) INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE PENTRU TEHNOLOGII IZOTOPICE SI MOLECULARE (RO) National Institute of Chemistry (SI) **Kunststofftechnik Bernt GmbH (DE)* University of Turku (FI)	SMWK (Germany) ANR (France) UEFISCDI (Romania) MIZS (Slovenia) AKA (Finland)
Innovative surfaces, coatings and interfaces	M-LUGE	Multi-scale laser surface texturing for low ice-friction contacts	3	Hochschule Mittweida (DE) Technische Universität Dresden (DE) Rigas Tehniska Universitate (LV)	SMWK (Germany) VIAA (Latvia)
Innovative surfaces, coatings and interfaces	PLASMANODE	Plasma-modified powder materials for Li-ion battery anodes processable by water-based techniques	4	University of Liège (BE) Innovative Coating Solutions (BE) Ferroglobe - Silicio Ferrosolar (ES) TioTech (NO)	SPW (Belgium) CDTI (Spain) RCN (Norway)
Innovative surfaces, coatings and interfaces	RESTINA	Recovered Silicon / Tin Sulphide Nanocomposite Anode Materials for Generation 3b Lithium Ion Batteries	4	AIT Austrian Institute of Technology GmbH (AT) FRIMECO Produktions GmbH (AT) University of Liege (BE) University of Vienna (AT)	FFG-MdZ (Austria) FNRS (Belgium)
Innovative surfaces, coatings and interfaces	SanFlex	Antipathogenic touchscreen polymer films	4	Fraunhofer FEP (DE) Chromogenics (SE) Uppsala University (SE) Naniform Science AB (SE)	SMWK (Germany) VINNOVA (Sweden)

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Innovative surfaces, coatings and interfaces	SOLIMEC	Enhancing the mechanical stability of interfaces in solid-state Li-ion batteries for energy-intensive applications	6	Universidad Autonoma de Madrid (ES) Montanuniversität Leoben (AT) Centre for advanced materials application SAS (SK) Norges Teknisk-Naturvitenskapelige Universitet NTNU (NO) Agencia Estatal Consejo Superior de Investigaciones Científicas (ES) AVL List GmbH (AT)	AEI (Spain) FFG-MdZ (Austria) SAS (Slovakia) RCN (Norway)
Innovative surfaces, coatings and interfaces	TOPCAPI	Advanced cutting Tools of predictable life with OPtimized Coating-substrate combination to be APplied in the Industry for machining of stainless steel	7	Torun Bakir Alasimlari Metal Sanayi Ve Ticaret AS (TR) Turkish-German University (TR) Kendu S. Coop. (ES) Boehlerit Sert Metal ve Takım Sanayi ve Ticaret A.Ş. (TR) Laip (ES) Totomak Makine ve Yedek Parça Sanayi ve Ticaret A.Ş. (TR) Ionbond Turkey (TR)	TUBITAK (Turkey) EJ-GV/Innobasque (Spain)
High performance composites	3DNano-HPC	3D Biotextile with Technological Composition of nano particles to enhance the protecting properties	4	JLU Technologies Ltd (LV) LATVIJAS UNIVERSITATE (LV) Nature Research Centre (LT) A Grupe, JSC (LT)	VIAA (Latvia) LMT (Lithuania)
High performance composites	DCEC2	Development of novel concept of engineered layered composites	3	Falex NV (BE) DFG Kft (HU) University of Miskolc (HU)	VLAIO (Belgium) NKFIH (Hungary)

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High performance composites	DuplexCER	High performance duplex ceramics for efficient machining of nickel superalloys		Łukasiewicz Research Network – Krakow Institute of Technology (PL) JG Group (PL) Institute of Materials Research, Slovak Academy of Sciences (SK) Tallinn University of Technology (EE)	NCBR (PL) SAS (Slovakia) ETAG (Estonia)
High performance composites	EcoMat	Durable bio-based polymer composites reinforced with natural waste fillers with antibacterial properties	3	Cracow University of Technology (PL) Ranplast sp. z.o.o. (PL) University of Latvia (LV)	NCBR (PL) VIAA (Latvia)
High performance composites	GEOSUMAT	Materials for Circular Economy: Industrial Waste Based Geopolymers Composites with Hybrid Reinforcement	8	UiT, The Arctic University of Tromso (NO) Gerosion Ltd (IS) Cracow University of Technology (PL) Specjalistyczne Przedsiebiorstwo Gornicze sp. z o.o. (PL) Babes-Bolyai University (RO) Czech Technical University in Prague (CZ) CHEMSTR-Safarik (CZ) ReforceTech AS (NO)	RCN (Norway) RANNIS (Iceland) NCBR (Poland) UEFISCDI (Romania) TACR (Czech Republic)
High performance composites	GRADIENT	Graded interphases for enhanced dielectric and mechanical strength of fiberreinforced composites	4	Leibniz-Institut für Polymerforschung Dresden e.V. (DE) Luleå tekniska universitet (LTU) (SE) University of Latvia (LV) **ABB Power Grids Sweden AB, Transformers Composites (SE)*	SMWK (Germany) VINNOVA (Sweden) VIAA (Latvia)

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High performance composites	MAR-WRECK	Development of geopolymer composites as a material for protection of hazardous wrecks and other critical underwater structures against corrosion	4	TU Bergakademie Freiberg (DE) Cracow University of Technology (PL) HIBRID Sp. z o.o. (PL) Technical University of Liberec (CZ)	SMWK (Germany) NCBR (Poland) TACR (Czech Republic)
High performance composites	MatDeMa	Affordable and Sustainable Multi-Material Lightweight Design and Manufacturing	4	Technical University of Chemnitz (TUC) (DE) Luxembourg Institute of Science & Technology (LIST) (LU) Riga Technical University (RTU) (LV) Ford Otomotiv Sanayi A.S (FORD) (TR)	SMWK (Germany) FNR (Luxemburg) VIAA (Latvia) TUBITAK (Turkey)
Functional materials	AfreeSSB	Anode-free all-solid-state batteries: From thin film to bulk	6	Empa - Swiss Federal Laboratories for Materials Science and Technology (CH) FLUXiM AG (CH) IREC - Institut de Recerca en Energia de Catalunya (ES) Alternative Energy Innovations, S.L. (ES) Forschungszentrum Jülich GmbH (DE) Aixtron SE (DE)	DETEC (Switzerland) AEI (Spain) CDTI (Spain) JÜLICH (Germany)
Functional materials	ALISA	Advanced Lithium-Sulfur batteries with ultramicroporous carbons	4	National Institute of Chemistry (SI) INM - Leibniz Institute for New Materials (DE) ETH Zürich (CH) Heraeus (DE)	MIZS (Slovenia) JÜLICH (Germany) DETEC (Switzerland)
Functional materials	BALSA	Bio-sourced Alternatives for Lithium-Silicon Anodes	7	Institutt For Energiteknikk (NO) University of Eastern Finland (FI) Luleå Tekniska Universitet (SE) Talga AB (SE) Centre d'études des procédés chimiques du Québec (CA) **Performance Biofilaments, Inc. (CA)* Transportøkonomisk Institutt (NO)	RCN (Norway) AKA (Finland) VINNOVA (Sweden) PRIMA (Canada)

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Functional materials	BRIGHT	Cellulose based Bio-foam for Interactive Energy Harvester	3	Associação ALMASCIENCE – Investigação e Desenvolvimento em Celulose para Aplicações Inteligentes e Sustentáveis (PT) Fraunhofer Institute for Ceramic Technologies and Systems IKTS (DE) Universidade nova de Lisboa (PT)	FCT (Portugal) SMWK (Germany)
Functional materials	COFFEE	Cationic Covalent Organic Frameworks as Anion Exchange Membranes for Electrochemical Energy Applications	3	SINTEF Industri (NO) CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (FR) UNIVERSITATEA BABES BOLYAI (RO)	RCN (Norway) ANR (France) UEFISCDI (Romania)
Functional materials	Cool BatMan	Battery Thermal Management System Based on High Power Density Digital Microfluidic Magnetocaloric Cooling	4	University of Ljubljana (SI) Josef Stefan Institute (SI) Leibniz Institute for Solid State and Materials Research Dresden (DE) Universitat de Barcelona (ES)	MIZS (Slovenia) SMWK (Germany) AEI (Spain)
Functional materials	FULSENS-GEL	INNOVATIVE FULLERENOL - HYDROGELS BASED NANOMATERIALS FOR HEALTH DIAGNOSTIC AND CARE APPLICATIONS		National Institute for Research&Development in Chemistry and Petrochemistry – ICECHIM (RO) Ordu University (TR) METROHM DROPSENS SL (ES) Chimgrup SRL (RO)	UEFISCDI (Romania) TUBITAK (Turkey) IDEPA (Spain)
Functional materials	GraSonics	High Sensitive Wideband Graphene Ultrasonic Transducers	3	Ústav fyzikální chemie J. Heyrovského AV ČR, v.v.i. (CZ) Fraunhofer Gesellschaft zur Förderung der angewandten Forschung E.V. (DE) PRZEDSIEBIORSTWO BADAWCZO-PRODUKCYJNE OPTEL SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA (PL)	TACR (Czech Republic) SMWK (Germany) NCBR (Poland)
Functional materials	HYDROSENS	Room temperature hydrogen sensors based on polycarbazole and its derivatives	5	Silesian University of Technology (Politechnika Śląska) (PL) Institute of Microelectronics of Barcelona, IMB-CNM-CSIC (ES) STC - Sensible Things that Communicate (SE) Polish Oil and Gas Company (Polskie Górnictwo Naftowe i Gazownictwo S.A.) (PL) MidDec Scandinavia AB (SE)	NCBR (Poland) AEI (Spain) VINNOVA (Sweden)

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Functional materials	IMMENSE	Inkjet manufacturing of CCMs for PEMFC by development of catalytic inks & their deposition	5	Fraunhofer ENAS (DE) Technische Universität Bergakademie Freiberg (DE) Universidad del País Vasco/Euskal Herriko Unibertsitatea/ POLYMAT (ES) University of Chemistry and Technology Prague (CZ) ÚJV Řež, a.s. (CZ)	SMWK (Germany) AEI (Spain) TACR (Czech Republic)
Functional materials	KESPER	Kesterite based Photoelectrodes for Water and Nitrogen Reduction	4	UHasselt (BE) Imec (BE) INL (PT) DTU (DK)	FWO (Belgium) FCT (Portugal) IFD (Denmark)
Functional materials	LASIBAT	Laser-based in-line sintering of adapted ceramic materials for the manufacturing of solid-state battery cells	5	Dilas Diodenlaser GmbH (DE) SINTEF AS (NO) Ceramic Powder Technology AS (NO) Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. on behalf of its Fraunhofer Institute "Institute for laser Technology" (DE) New Infrared Technologies S.L. (ES)	JÜLICH (Germany) RCN (Norway) CDTI (Spain)
Functional materials	LDI MAGIC	Laser Direct Imaging Material and Process Developments for Next Generation Integrated Chipless RFID	3	Fraunhofer IKTS (DE) Gdansk University of Technology (PL) ISS RFID Sp. z o.o. (PL)	SMWK (Germany) NCBR (Poland)
Functional materials	NanoTRAACES	Ultrasensitive sensors for the detection of Lithium Ion Batteries fails	7	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE - DR10 Alsace (FR) Centre Nationale d'Etudes Spatiales (FR) Kaunas University of Technology (LT) Luxembourg Institute of Science and Technology (LU) Gwangju Institute of Science and Technology (KR) **SAFT (FR)* UNS Energy (KR)	ANR (France) LMT (Lithuania) FNR (Luxemburg) KIAT (Rebublic of Korea)

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Functional materials	NanOx4EStor	Nanoscaled ferroelectric (pseudo)-binary oxide thin film supercapacitors for flexible and ultrafast pulsed power electronics	3	University of Minho (PT) National Institute of Materials Physics (RO) Ecole Centrale de Lyon (FR)	FCT (Portugal) UEFISCDI (Romania) ANR (France)
Functional materials	PRINTCAP	next generation of 3D printed structural supercapacitors	4	Technische Universität Dresden (TUD) (DE) Hochschule für Technik Wirtschaft und Kultur Leipzig (HTWK Leipzig) (DE) THALES SA (TRT) (FR) NAWA Technologies (FR)	SMWK (Germany) ANR (France)
Functional materials	SPIRIT	Solid state Potassium-Ion batteRIes for safe and susTainable energy storage	6	Universidad Complutense de Madrid, Spain (ES) Karlsruhe Institute of Technology (DE) Instituto de Ciencia y Tecnología de Polímeros del CSIC, Spain (ES) Weizzmann Institute of Science (IL) Iolitec (DE) Uppsala University (SE)	AEI (Spain) JÜLICH (Germany) MOST IL (Israel) VINNOVA (Sweden)
Functional materials	SuperSuper	Alternative Superconducting Superlattices	4	POLYMAT (ES) University of Aveiro (PT) Graphenea Semiconductor S.L. (ES) Katholieke Universiteit Leuven (BE)	AEI (Spain) FCT (Portugal) CDTI (Spain) FWO (Belgium)
Functional materials	SuSaNa	Sustainable and Safe anode-free Na battery	7	Agencia Estatal Consejo Superior de Investigaciones Científicas (ES) Forschungszentrum Jülich GmbH (DE) Altris AB (SE) Technical University of Denmark (DK) PhaseTree ApS (DK) Uppsala University (SE) ACCUREC-RECYCLING GMBH (DE)	AEI (Spain) JÜLICH (Germany) VINNOVA (Sweden) IFD (Denmark)
Functional materials	SUSTBATT	Scalable Sustainable Anodes for Li-ion Batteries by Structural Design	6	Norwegian University of Science and Technology (NO) SINTEF Energy AS (NO) Swedish Algae Factory (SE) LiFeSiZE (SE) University of Uppsala (SE) CSIC (ES)	RCN (Norway) VINNOVA (Sweden) AEI (Spain)

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Functional materials	Thermos	Tellurium-Free Thermoelectric Modules by Interface Engineering	5	IFW Dresden (DE) CIC nanoGUNE (ES) University of Pardubice (CZ) Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM Dresden (DE) TEGnology ApS (DK)	SMWK (Germany) AEI (Spain) TACR (Czech Republic) IFD (Denmark)
Functional materials	ZABAT	Next generation rechargeable and sustainable Zinc-Air batteries	5	LEITAT (ES) SINTEF (NO) Fraunhofer Institut (DE) Politechnika Wroclawska (PL) HEREUS (DE)	AEI (Spain) RCN (Norway) JÜLICH (Germany) NCN (Poland)
Functional materials	ZABSES	Zinc-Air Battery for the Stationary Electricity Storage	4	Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (DE) SUNERGY (FR) Deutsches Zentrum für Luft- und Raumfahrt (DE) CY Cergy Paris Université (FR)	JÜLICH (Germany) ANR (France)
New strategies for advanced material-based technologies in health applications	bioMAT4EYE	Neoteric Biomaterials for hIPSCs Monitorized Differentiation to RGCs: Creation, Microfabrication & Microfluidics	8	Universidad Complutense de Madrid (ES) Fundación para la Investigación Biomédica del Hospital Universitario (ES) Katholieke Universiteit Leuven (BE) RISE PFI AS (NO) University of Ljubljana (SI) Chitinor AS (NO) Regemat 3D Ltd (ES) Leipzig University (DE)	AEI (Spain) FWO (Belgium) RCN (Norway) MIZS (Slovenia) CDTI (Spain) SMWK (Germany)
New strategies for advanced material-based technologies in health applications	MBrace	Multi-Matrix Composites for Fashionable, Customized and Evolvable Braces	6	Leibniz-Institut für Polymerforschung Dresden e. V. (DE) Technische Universität Dresden (DE) SIRRIS (BE) Isomatex (BE) **Jan Kochanowski University of Kielce (PL)* HTW Dresden (DE)	SMWK (Germany) SPW (Belgium)

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New strategies for advanced material-based technologies in health applications	Mem4BoTiReg	Biodegradable functionalized Membrane for Bone and Tissue Regeneration	4	TU Dresden, Faculty of Medicine (DE) Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (DE) Ibirapuera University (BR) Nano Prime Sp. z o. o. (PL)	SMWK (Germany) FAPESP (Brazil NCBR (Poland)
New strategies for advanced material-based technologies in health applications	Nano4Glio	Engineered nano-based device for glioblastoma multiforme therapy	4	Faculty of Engineering of University of Porto (PT) i3S – Instituto de Investigação e Inovação em Saúde da Universidade do Porto (PT) SINTEF AS (NO) University of Copenhagen (DK)	FCT (Portugal) RCN (Norway) IFD (Denmark)
New strategies for advanced material-based technologies in health applications	PIECRISCI	Investigation of Regenerative Effects of CRISPR / Cas9 Functionalized Piezoelectric Nerve Conduits on in vitro and in vivo Spinal Cord Injury Models	5	Ege University (TR) Ege University School of Medicine (TR) MARSTEM Cell Technologies Inc. (TR) AGH University of Science and Technology (PL) Aarhus University (DK)	TUBITAK (Turkey) NCN (Poland) IFD (Denmark)
New strategies for advanced material-based technologies in health applications	RePark	Refining the efficacy of systemic administration of bioactive molecules for Parkinson's Disease	3	University of Antwerp (BE) University of Minho (PT) Tel Aviv University (IL)	FWO (Belgium) FCT (Portugal) MOST IL (Israel)
New strategies for advanced material-based technologies in health applications	-SMILE-	Surface coating and MIcrostructuring for compound functionaLisEd biomaterials in dentistry	4	Technische Universität Dresden, Medical Faculty Carl Gustav Carus (DE) Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (DE) Bialystok University of Technology, Faculty of Mechanical Engineering (PL) University POLITEHNICA of Bucharest (RO)	SMWK (Germany) NCN (Poland) UEFISCDI (Romania)
New strategies for advanced material-based technologies in health applications	TARDIS	Nano-enabled stimuli-responsive scaffolds for targeted antimicrobials delivery to treat Staphylococcus aureus infections and restore skin homeostasis	5	Universitat Politècnica de Catalunya (ES) SINTEF OCEAN AS (NO) Marmara University (TR) Sofia University (BG) Dead Sea and Arava Science Center (IL)	AEI (Spain) RCN (Norway) TUBITAK (Turkey) BNSF (Bulgaria) MOST IL (Israel)

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New strategies for advanced material-based technologies in health applications	VENUS	Anti-calcification treatment of elastin-rich bioprosthetic materials using Fetuin A for aortic valved conduits	5	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (DE) University of Latvia (LV) Institute of Immunology and Experimental Therapy, Polish Academy of Sciences (PL) Marmara University (TR) ALVIMEDICA TIBBI URUNLER SAN. ve DIS TIC. A.S. (TR)	SMWK (Germany) VIAA (Latvia) NCN (Poland) TUBITAK (Turkey)
Materials for Additive Manufacturing	3D-FOAM	Foamed Geopolymer Made by Additive Manufacturing for the Construction Technology Applications	5	Cracow University of Technology (PL) ATMAT (PL) Riga Technical University (LV) University of Miskolc (HU) National Ilan University (TW)	NCBR (Poland) VIAA (Latvia) NKFIH (Hungary) MOST TW (Taiwan)
Materials for Additive Manufacturing	AddMag	Additive manufacturing of permanent magnet materials	7	Graz University of Technology (AT) AVL List GmbH (AT) Vega Technik GmbH (AT) Jozef- Stefan- Institute (SI) MagREEsource (FR) Metalpine GmbH (AT) Institute Néel – CNRS (FR)	FFG-PdZ (Austria) MIZS (Slovenia) ANR (France)
Materials for Additive Manufacturing	AM-ACTS	Additive Manufacturing of Actively Cooled Thermal Shields	5	Universidad de Extremadura (ES) Iberespacio (ES) University West (SE) Questek (SE) Laboratoire Procédés, Matériaux et Energie Solaire (PROMES) (FR)	AEI (Spain) CDTI (Spain) VINNOVA (Sweden) ANR (France)
Materials for Additive Manufacturing	BioCel3D	Cellulose from waste and bacteria in electro-spinning for continuous fibre reinforced 3D printed composites	4	Luxembourg Institute of Science and Technology (LU) KU Leuven (BE) University of Maribor (SI) **Graz University of Technology (AT)*	FNR (Luxemburg) FWO (Belgium) MIZS (Slovenia)
Materials for Additive Manufacturing	CerAM SLS	Qualification of thermoset-based powders for selective laser sintering of ceramic components	3	TIGER Coatings GmbH & Co KG (AT) Fraunhofer Society (DE) Hochschule Mittweida (DE)	FFG-PdZ (Austria) SMWK (Germany)

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Materials for Additive Manufacturing	LIFOMUL 3D	LIgnin FOrmulations for MULtimaterial 3D printing of microneedle electrodes	6	Alpin3D e.U. (AT) FH Technikum Wien (AT) Leibniz-Institut für Polymerforschung Dresden e. V. (DE) AIT Austrian Institute of Technology GmbH (AT) In-Vision Technologies AG (AT) Alpin3D GmbH (AT)	FFG-PdZ (Austria) SMWK (Germany)
Materials for Additive Manufacturing	Pompey	Polymer-Metal 3D Printing using Hybrid Material Extrusion	3	Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V. for its Institute Fraunhofer IWU (DE) Chemnitz University of Technology (DE) Omni3D Ltd (PL)	SMWK (Germany) NCBR (Poland)
Materials for Additive Manufacturing	PowderEUse	Novel method of polyamide powders reconditioning for re-use in selective laser sintering process	4	Wrocław University of Science and Technology (PL) Fraunhofer IWU (DE) SondaSYS sp. z o.o. (PL) Zakład Badawczy Przemysłu Piekarskiego Sp. z o.o. (PL)	NCBR (Poland) SMWK (Germany)

Publishable abstract of the projects:

3D-FOAM

Foamed Geopolymer Made by Additive Manufacturing for the Construction Technology Applications

The main challenge is the design of zero-waste technology for 3D printing and the use of waste products such as clay bricks, aerated concrete, disintegrated cement, etc., as raw material. The project is focused on developing foamed ceramic materials for additive manufacturing – 3D printing technology, especially geopolymer composites (GP) and hybrid geopolymer composites (HGP) with customized properties for additive manufacturing (AM) used as insolation. Expected result of the project is to design a new class of materials and with high thermal properties and, in the same time, non-inflammable materials (heat-resistant materials and thermal barrier). The most important expected properties are: controlled porous structure, low density, high thermal resistance, good mechanical properties, fire- and heat resistant, better workability in comparison to conventional construction foamed materials, eco-friendliness and cost-effectiveness.

3DNano-HPC

3D Biotextile with Technological Composition of nano particles to enhance the protecting properties

The objective of the project is the development of innovative 3D biotextile based on the establishment of a technological platform, to produce innovative high performance composite. It represents the complete chain of production, from technological development of new textile to bio-testing applications, and, therefore, provides feedback within the system for optimization of processing requirements.

Potential benefits: extension of boundaries to the protective properties, provide enhanced protection against different frequency & density electromagnetic fields low frequencies, Radiofrequency range, as well protection from ultraviolet radiation and will create of the mechanical barrier from the negatively charged micro pollutant particles.

A new material is very important under contemporary conditions when the majority of population live in urbanized areas steadily affected with electromagnetic fields, ultraviolet radiation of high intensity and pollutant particles.

AddMag

Additive manufacturing of permanent magnet materials

Due to rapid improvements in devices for sustainable energy, the demand for precisely shaped and miniaturized permanent magnets is ever growing. Since these demands cannot be met with conventional manufacturing methods, additive manufacturing has to be applied and in recent years, it has already presented itself as more and more important in the production of permanent magnets

In this project, the additive manufacturing process of two magnetic materials, Nd-Fe-B and Fe-Cr-Co will be examined. New approaches will be followed by using various base materials like amorphous powders and powders from recycled end- of- life magnets and by printing via in-situ alloying of powder mixtures.

Possible applications will be mostly magnets for electronic devices and for electric engines as these are key sectors for this type of materials. The recycling or reduction of rare- earth elements in these production chains will have both positive environmental and societal impacts.

AfreeSSB

Anode-free all-solid-state batteries: From thin film to bulk

The project aims to develop solid-state batteries (SSBs) with power densities >1000 W/L and energy densities >800 Wh/L, combined with fast charging and discharging, deep discharge cycles, long cycle life, and safe operation in a wide temperature range. Potential applications for these batteries include high-end and mobile applications such as drones, robots, aerospace, and urban mobility.

Selected innovation objectives are: i) To develop anode-free thin-film SSBs with high power densities, ii) to transfer the anode-free concept to bulk cathodes for high energy densities, iii) to develop operando characterisation methods, and iv) to demonstrate the SSB performance in an operational environment.

The expected impacts include: i) SSBs for industrial Internet of Things that require safe operation in a wide temperature range, ii) new software and measurement hardware products for battery testing, and iii) the roll-to-roll fabrication of carbon-coated current collectors for anode-free SSBs.

ALISA

Advanced Lithium-Sulfur batteries with ultramicroporous carbons

Batteries with sustainable materials, high energy densities, and high lifetime are needed to reduce fossil fuel consumption and to reach the targets in the European Green Deal. The developed batteries have a wide range of applications, from electric mobility, stationary storage in the power grids sector to military and space applications. Therefore, batteries will have a significant positive societal impact on safety, economics, employment, and quality of life.

Lithium-sulfur batteries are promising candidates, yet polysulfide electrolyte solubility limits their operation. The ALISA project aims to optimize solid-state sulfur conversion in lithium-sulfur batteries by employing ultramicroporous carbon cathodes with liquid carbonate electrolytes. We will couple advanced structural and electrochemical characterization with the development of carbonaceous materials. The project will result in a lithium-sulfur battery prototype with high cycle life and high specific energy.

AM-ACTS

Additive Manufacturing of Actively Cooled Thermal Shields

High-temperature Thermal Protection Systems (TPS) are critical in many industrial applications (aerospace, energy generation, etc.), and they typically rely on passive thermal insulation, which is limited by the oxidation and ablation resistance of their constituent materials. AM-ACTS project will develop novel high-performance thermal shields that can be actively cooled by circulating an appropriate fluid through a bioinspired internal microchannel network created during the additive fabrication (3D printing) of the TPS elements from ultra-high temperature ceramics and refractory metals. This will enable the sustainable and environmentally friendly production of atmospheric re-entry shields for reusable spacecrafts, turbine blades, rocket engines, reactor walls or solar receivers with improved maximum service temperature and/or service lifetime at that temperature, which could boost the energy efficiency and reduce maintenance costs in these and many other industrial applications.

ARISER

Large Area Magnetron Sputtered All-Solid-State Batteries with ALD Buffer Layers

This project aims to develop a large area all-solid-state battery (ASSB) and proposes two innovative approaches in order to improve the performance of proposed ASSB. The performance of ASSBs could be improved by increasing the ionic conductivity of electrolyte layer and engineering the electrode/electrolyte interfaces. Since a conventional high temperature processing causes Li-loss from the electrolyte, stoichiometry changes unintentionally. Therefore, firstly, a novel dual-deposition technique will be used to fabricate high Li-ion conductive electrolyte layer with proper stoichiometry. Secondly, in order to improve the electrode/electrolyte interface, a new approach in which ALD-grown mixed-metal-oxide buffer nanolayers with various proportions will be developed. Applicability of the proposed ASSB structure will be tested in large-scale (15 cm x 15 cm) to achieve higher capacities and energy densities. ASSBs application areas could be in electric vehicles.

BALSA

Bio-sourced Alternatives for Lithium-Silicon Anodes

The rationale of the BALSA project is a growing concern over the raw materials supply required to the projected explosive growth in Li-ion battery production, especially of critical metals like Co and Cu. One potential solution to this problem is to develop a battery which is mostly composed of bio-sourced functional materials, thereby addressing both the technological and societal needs for the European Green Deal and skilled job creation in rural, agricultural regions. The objective of BALSA is to combine a mesoporous, surface-passivated Si and carbon nanofibre composite anode with a quasi-solid-state electrolyte with reduced copper weight and carbon footprint. Once prelithiated and assembled, the BALSA battery would find potential applications in electric vehicles or other consumer electronics. The success of BALSA would impact advocacy for greater use of bio-sourced materials in other technologies and create new economic opportunities as an exploitable benefit to the industry.

BATMAN

Development of novel Li ion BATtery solid electrolyte separators based on Metal orgANic frameworks

Currently, Ni-based Li ion batteries represent the dominant technology for the electric vehicles. It is estimated that LiFePO4 batteries will be increasingly used due to their lower production costs, good thermal stability and higher intrinsic safety relative to traditionally used battery systems. To overcome their low energy density which hinders large scale applications, BATMAN will develop novel solid state separators based on thermally stable MOF/polymer composites using Creonia Cell's novel low cost and environmentally friendly CREOcell roll-to-roll separator manufacturing process, targeting to reach TRL 5 for the separators at the end of the project. This challenging task is fulfilled through an interdisciplinary transnational network of research groups. The proposed work is envisioned to pave the way towards solid state batteries with higher specific energy densities and improved safety, thus strongly contributing to the transition towards a sustainable energy society.

BattPor

Inline evaluation of Li-ion battery electrode porosity using machine learning algorithms

The background to the BattPor project is the increasing demand for high-performance battery technologies with integrated quality assurance at all stages of production. The focus here is on the calendering process used in the production of Li-ion battery electrodes. In this process step, a certain porosity is set by recompacting the coated and dried electrodes. It is essential to monitor this porosity inline to specifically increase the performance of the battery products.

The main objective of the BattPor project is to develop automated optical testing technology with AI-based porosity detection in a continuous roll-to-roll calendaring line. Thus, in the applied M-ERA-NET funded project, the development of this inline testing technology shall be performed on a pre-industrial scale up to a TRL of four.

The proposed project serves in the context of battery research and electromobility within the framework of the planned EU-wide energy transition.

BioCel3D

Cellulose from waste and bacteria in electro-spinning for continuous fibre reinforced 3D printed composites

Natural fibre potential as reinforcement in composites is restricted by their inherent properties (e.g. moisture sorption) and variability (mechanical properties are different even for same species). Continuous reinforcing yarn is used in 3D printing, providing more strength and stiffness. For continuous natural fibre reinforced filaments, fibres must be twisted to keep the yarn integrity, reducing the mechanical properties of the composite due to fibre misalignment.

BioCell3D proposes the incorporation of an aligned cellulose based reinforcement for continuous fibre 3D printing by creating our own technical natural fibre with hierarchical organization and enhanced physical properties. Continuous reinforcement will be obtained by electrospinning of cellulose derivatives as well as bacterial cellulose.

The project aims to develop a “green” 3D printing additive technology for advanced structural applications, contributing to meet the regulatory requirements of recyclability.

bioMAT4EYE

Neoteric Biomaterials for hIPSCs Monitorized Differentiation to RGCs: Creation, Microfabrication & Microfluidics

Matrigel is a benchmark costly supporting material for cell culture, being a basement membrane matrix extracted from Engelbreth–Holm–Swarm murine sarcomas, presenting ethical issues, low productivity, low batch-to-batch reproducibility, and an extraordinary complex physicochemical nature. Therefore, highly reliable and tuneable materials adequate for large-scale production to replace Matrigel are desirable. bioMAT4EYE will address this need by joining several multidisciplinary research teams with key expertise in biomaterial production (fermentation, extraction), physicochemical modification and conformation in 2D, 2D+ and 3D structures by diverse technologies, micro-bioreactor design, construction and physicochemical control, and hiPSCs generation, culture and monitored differentiation to RGCs. RGCs can be the basis for cell therapies for patients with optic neuropathies of low prevalence (e.g. LHON, DOA) and age-related increasingly prevalent ones (e.g. glaucoma).

BRIGHT

Cellulose based Bio-foam for Interactive Energy Harvester

Mechanical energy harvesting concepts assume a great relevance as a game changing contribute for “green energy”. The surface electrification concept has gained momentum with the possibility of extending it to large areas, concerning with the eco-design strategies.

BRIGHT proposes a new conception of designed cellulose-based bio-foams functionalized by conjugated polymers and bio compatible elastomers. The resulting unique mechanical response will be grounded on unique macro to microscale simulation and design strategies, while the proposed circuitry design allows for improved efficiency and integrated sensing functionalities with energy harvester for sustainable large area self-powered systems.

Outputs of BRIGHT will impact wearables sectors such as transportation. The general outcomes are fully aligned the future challenges concerning sustainability, namely in diversifying energy sources, raw materials rational utilization, carbon neutrality and eco-design of products and systems.

CerAM SLS

Qualification of thermoset-based powders for selective laser sintering of ceramic components

Rationale/Needs to be addressed: According to the United Nations more than 2 billion people have no direct access to safe drinking water resources. CerAM SLS addresses the removal of trace contaminants like residual pharmaceuticals in order to improve water quality.

Objectives: CerAM SLS will develop photocatalytic ceramic structures through the qualification of Additive Manufacturing (AM) processes by employing thermoset TiO2 - filled feedstock to be used in Selective Laser Sintering (SLS) with subsequent thermal processing of the green parts.

Potential applications: Within CerAM SLS the application potential of photo-catalytically active ceramic devices will be targeted towards point-of-use water treatment (tap water) and point-of-emission waste water treatment (hospitals).

Impact and potential benefits: Scaling the targeted applications to European dimensions the project has a potential of 4.3 million units of CerAM SLS modules to be provided for water treatment.

COFFEE

Cationic Covalent Organic Frameworks as Anion Exchange Membranes for Electrochemical Energy Applications

Rationale: Anion exchange membranes (AEMs) remain plagued by either low stability in an alkaline environment or low ionic conductivities. To overcome these challenges, careful consideration of the chemical structure of both the polymer backbone and the cationic head group is required.

Objectives: The COFFEE project addresses these challenges by proposing a novel class of AEMs based on covalent organic frameworks (COFs) to promote enhanced membrane stability, conductivity, and selectivity.

Potential applications: Key applications for the COF-based AEMs will be AEM water electrolysers and zinc-air batteries.

Impact & potential benefits: The development of durable, high-performance AEMs will push these developmental technologies closer to commercial viability. The successful commercialisation of low-cost electrolyser and battery technologies will contribute to the widespread adoption of renewable energy solutions and directly support Europe's greenhouse gas emission reduction targets.

Cool BatMan

Battery Thermal Management System Based on High Power Density Digital Microfluidic Magnetocaloric Cooling

Li-ion batteries are key to transitioning away from the fossil fuels dependence in the next decade. A major bottleneck in Li-ion's efficient and reliable operation is their narrow temperature range where they operate at full efficiency without major degradation. There are two key aspects of battery thermal management system (BTMS); high efficiency and compactness. In e-mobility compact BTMS preferably with no moving parts is of the utmost importance. The majority of BTMSs are based on vapor-compression technology. Due to utilization of environmentally harmful refrigerants and moderate efficiency there is a need for more efficient cooling technologies. One showing such potential is magnetocaloric (MC) cooling. The MC material will be coupled with an ElectroWetting On Dielectric (EWOD) phenomenon to form a unique MC cooling principle. The goal of the project is to develop a compact MC/EWOD cooling proof-of-principle suitable for integration as BTMS for Li-ion batteries in e-mobility.

DCEC2

Development of novel concept of engineered layered composites

In many high-tech applications, efficient heat dissipation is the key to functionality. Developing engineered layered composites that combine surface performance with bulk heat dissipation is challenging because many combinations are possible.

By producing the digital twin of a component, such development can be accelerated. Layered composites are mathematically designed, produced by additive manufacturing and then validated on the lab scale.

A new generation of railroad brakes is a major potential application with large impact on Europe's climate ambitions. Increasing traffic volume requires safe and maintenance friendly brakes, with improved wear resistance, noise reduction and enhanced heat transfer achieved by a layered composite. Another application field, where fast heat dissipation is key, is microelectronics.

Focus is the impact on brakes, about 250.000 wagons with 32 brakes will need an update in the near future to make international railroad traffic safer.

DuplexCER

High performance duplex ceramics for efficient machining of nickel superalloys

Rationale/Needs to be addressed: The DuplexCER project responds to the need to increase the efficiency and reliability of the machining processes of difficult-to-cut nickel superalloys, widely used in the aerospace and energy industry.

Objectives: The aim of the project is to utilize the beneficial properties of duplex, continuous, interpenetrating oxide-carbide phases to obtain a new sintered tool material and to reduce the consumption of Critical Raw Materials (CRM: W, Co) by recycling of cutting inserts.

Potential applications: The result of the project will be advanced ceramic composite dedicated mainly to the tool industry, but its other applications will also be possible, especially to work in extreme conditions (temperature, loads, abrasion).

Impact and potential benefits: The proposed solution will contribute to: increasing machining efficiency and reliability, minimizing the use of CRM, to the development of closed-loop strategy, to improve health and safety of the workers.

EcoMat

Durable bio-based polymer composites reinforced with natural waste fillers with antibacterial properties

larming information on environmental pollution prompts the scientific society and industry to look for sustainable solutions aimed at reducing the negative impact of manufactured products on the environment. Therefore, the project will aim to create a functional, ecological polymer composite based on bio-based PET reinforced with natural waste particles (coffee grounds, eggs and molluscs shells) with antibacterial properties. As a result of the project, universal

chemical modifications of fillers will be proposed in order to increase the adhesion of the fiber/matrix, which will positively affect the strength properties. Moreover, a universal mathematical model will be developed, the task of which will be to predict the properties of polymeric materials and the life expectancy of the manufactured materials. The produced materials can be successfully used in many industrial sectors, both for products with a short and long life cycle.

FULSENS-GEL

INNOVATIVE FULLERENOL - HYDROGELS BASED NANOMATERIALS FOR HEALTH DIAGNOSTIC AND CARE APPLICATIONS

The project aims to develop an innovative nanomaterial with tunable network structures and improved electrochemical/ mechanical/ optical properties, with active surface for sensing applications. The innovative objectives aims to develop: a) new fullerenol(FL)-Hydrogel nanomaterials with better functionality and opto-electrochemical performances; b) (bio)sensitive FL-Hydrogels with higher stability, selectivity and sensitivity; c) flexible, wearable FL-Hydrogels multiplex patches for rapid and efficient health status screening. Outcomes: 1) innovative, low cost, conductive FL-Hydrogel; 2) TRL5 validated FL-Hydrogel with high flexibility, conformability and opto-electrochemical features; 3) flexible wearable patch. An important impact on scientific community, industry and society will be produced by the fast real-time monitoring of health/food quality through the development, production and valorization of new wearable/portable FL-Hydrogel tools for detection of contaminants/pathogens.

GEOSUMAT

Materials for Circular Economy: Industrial Waste Based Geopolymers Composites with Hybrid Reinforcement

The main objective of GEOSUMAT “Materials for circular economy - industrial waste based geopolymers composites with hybrid reinforcement” is to design and characterise new fibre reinforced eco-friendly geopolymers (GPs) composites based on industrial and mining wastes. The principal drivers for the GEOSUMAT concept are:

• Re-use of local waste resources to support local businesses and contribute to circular economy principles

• Achieve CO2 reductions through the replacement of concrete in construction applications and its capture during casting and curing stages

• Encourage preservation of natural resources.

In addition, to investigate and improve the mechanical and functional properties of the material, a study of hybrid reinforcement using glass minibars, basalt fibres and waste polymer materials used as fibres. The resulting GPs composites will be for civil engineering applications such as precast elements predominantly for marine ambient applications and industrial floors.

GoFIB

Gallium Oxide Fabrication with Ion Beams

Gallium oxide is a novel ultra-wide band gap material, and the rationale is that its thin film fabrication technology is immature. In particular, the metastability conditions are difficult to control during sequential deposition of different polymorphs with existing techniques. However, the polymorphism may turn into a significant advantage if one can gain control over the polymorph multilayer and nanostructure design. Our objective is to develop a method for the controllable solid state polymorph conversion of gallium oxide assisted by ion irradiation, capitalizing on encouraging preliminary data. This fabrication method may pave the way for several potential applications (e.g. in power electronics, optoelectronics, thermoelectricity, batteries) and we will test the corresponding functionalities during the project. Thus, we envisage multiple positive impacts and potential benefits across a wide range of stakeholders.

Gold-PAWS

Sustainable Production Process for High-Quality Gold-Plated Wires for Antennae

Electroplating technology suffers from limited sustainability, due to its wide-spread reliability on wet chemical processes, toxic materials, and high consumptions of energy.

The proposed project aims to improve both the sustainability of the plating process of ultra-thin wires and the coating performance, by establishing the first ever reel-to-reel, environmentally friendly and dry coating process for ultra-thin wires, based on the combination of a physical vapour deposition (PVD) process and an ion beam implantation post-treatment.

The resulting superiority in sustainability will be demonstrated with reference to defined sustainability criteria and benchmarks, whilst the quality improvement of the resulting gold-plated wires will enable an estimated increase in turnover by 20 MSEK (i.e. 40%) between 2024 and 2027 at LUMA, while IONICS will be able commercialise its platform technology in entirely new market sectors, and MANO will widen its R&I service to a new set of clients.

GRADIENT

Graded interphases for enhanced dielectric and mechanical strength of fiberreinforced composites

Power transformers and switchgears are key components made of high-performance compositesused in power grids. Their availability and robustness have a decisive influence on the reliabilityand profitability especially for the future expansion of power grids. Their mechanical but alsodielectric composite strength is strongly determined by the fiber-matrix interphase as the origin of micro-scale damage.

The objective of the project is the development of approaches to reduce stress concentrations in the interphase in order to increase the durability of composite structures. This is achieved by fiber surface modification for a gradation of the interphase to avoid the distinct stiffness difference occurring between fiber and matrix.

The project addresses the need for new methodologies and validation tools for interphase optimization required in all composite market sectors to gain knowhow in the complex field of interphase formation, their stress transfer capability and damage behavior.

GraSonics

High Sensitive Wideband Graphene Ultrasonic Transducers

GraSonics is a project of three partners from three countries (Czech Republic, Germany and Poland) bringing together competences in the field of graphene, MEMS and ultrasonics. Graphene membranes, as the thinnest elastic membranes, can offer significantly better vibration, sound generation and reception performance than metal or silicon membranes. The main goal is to deliver an innovative solution answering to current demand for high precision and wideband ultrasonic devices applicable in many areas including collision detection and echolocation, robotic applications or medical imaging.

GraSonics will utilize graphene layer(s) as vibrating membranes of electrostatically driven capacitive micromachined ultrasound transducers (CMUTs) especially for air ultrasound transducers with high frequencies (>300 kHz). The main project outcome (functional sample of the Graphene Ultrasound Transducer) will reach Technology Readiness Level 4 at the end of the project (technology validated in lab).

GREEN-BAT

GRadient- and multi-matErial procEssing of Next-generation solid-state-lithium BAtteries using direct maTerial processing.

Despite the presence of excellent state-of-the-art (SOTA) materials for electrodes and electrolyte, the adoption of all-solid-state-lithium-batteries (ASSLBs) by various industries is limited due to the cumbersome SOTA manufacturing technologies used for ASSLBs. The GREEN-BAT project is aiming to bring a technological innovation in the field of solid-state-batteries by proposing a novel single-step manufacturing route to produce individual ASSLB constituents and subsequently explore sequential processing for their facile consolidation into full ASSLB cell; using direct multi-material processing technologies (i.e., L-DED and plasma spray) in lieu of the current SOTA ASSLB several-step manufacturing route where different manufacturing technologies are used to produce different ASSLB constituents (current collectors, electrodes and electrolyte). Successful realization of GREEN-BAT will have a significant impact on the ASSLB market serving several industrial sectors, especially transport.

Greenhouse-PV

Semi-transparent PV coatings for greenhouse application

The increasing global population places demands on food production that cannot be met by traditional agriculture and today availability of food for all people in the world is one of the major challenges for humanity. Existing agriculture has some negative consequences, such as deforestation, unsustainable water usage, and contamination of water and soil with pesticides. One of the promising approaches for effective land usage, and the reduction the water and pesticides consumption is greenhouse-based agriculture. However, extensive use of greenhouses has one major limitation which is higher energy consumption compared to traditional agriculture. Therefore, the goal of this project is development semi-transparent solar cells that can be integrated into greenhouse constructions and serve as a source of electricity. The project will develop a concept for Net Zero Energy Greenhouses assuring a viable solution for sustainable agriculture and reducing dependency on fossil fuels.

HardCoat

Surface hardening and highly wear-resistant nanocomposite coatings for woodworking tools

Application of progressive surface modifications technology plays a key role in the enhancement of material usage and improvement of surface durability with huge consequences on materials safety and sustainability. This holds especially for protective coatings used in machining and cutting applications. The project aims for the development of novel super hard/durable protective coatings optimized for wood cutting and processing tools via progressive plasma and ion-based techniques. Cathodic arc and magnetron sputtering will be coupled with thermochemical treatment for fabrication of nano/micro hierarchical coating with ultimate parameters. These coatings will be optimized for the best performance in wood machining and cutting in order to outperform the current state-of-the-art materials. Employment of the new generation of cutting tools targets lowering the energy consumption and operational costs by increasing the lifetime and by the broadening of cutting tools operation conditions.

HYDROSENS

Room temperature hydrogen sensors based on polycarbazole and its derivatives

The main objective and innovation of the HydroSens project is the exploration of the use of conjugated polymers based on carbazole-derived repeat units as selective receptor layers for hydrogen sensors. In particular, the ability of the sensors to operate at room temperature makes them an energy-efficient and safe (no risk of H2 ignition from the sensor) sensing solution. The HydroSens devices do not require costly high-purity materials or high-temperature processing, instead employing solution-processing methods for the deposition of receptor layers.

The results of the project are expected to help minimise greenhouse gas emissions both directly (reduced energy consumption) and indirectly, by promoting the development of an increasingly safe “hydrogen industry”, contributing to a transition from a carbon-based economy to one based on clean and sustainable fuels and energy, such as hydrogen fuel cells.

I4BAGS

Ion Implantation for Innovative Interface modifications in BAttery and Graphene-enabled Systems

The I4BAGS project aims to develop innovative processing and characterisation solutions for higher performances in microelectronics and battery applications. This implies monitoring of materials and interface properties of graphene-on-SiC Hall effect sensors and vertical rectifiers, and of thin-film solid batteries. Planned processing encompasses low-energy ion implantation tailored for targeted application. Broad frequency range characterisation methods from DC to millimetre waves supported by suitable modelling and software contribute to describe electrical properties of materials, structures, interfaces and devices. Generated data are to be collected within open innovation environment and disseminated throughout European Materials Communities. Expected implementation includes electric transportation, smart metering, power applications and electricity storage solutions. The project is supported by private stakeholders to promote transfer of innovation to European industries.

IMMENSE

Inkjet manufacturing of CCMs for PEMFC by development of catalytic inks & their deposition

In the course of global undertakings to achieve a CO2-neutral energy economy, the German-Spanish-Czech consortium of the project named IMMENSE targets the UN sustainable development goals (SDG) 7 and 9. In detail, it plans to make impact on the current fuel cell technology by tailoring the catalytic ink and processing it using digital inkjet-printing technology supplementing the currently used analogous processes. The consortium represents experts for material development focussing on tuning interfacial properties. In focus are a flexible design of CCMs, reducing manufacturing costs, experimental characterization and advanced mathematical modelling. A short stack fuel cell demonstrator will validate the new manufacturing technology based on an optimized material system that shows similar performance as conventionally produced fuel cells used for mobile applications, i.e. in a car. To reflect all developments according to market needs, an industrial partner is part of the consortium.

InsBIOration

Bio-inspired interfaces for the development of next generation degradable multi-phase materials

Societal needs demand substitution of processes with high energy consumption or using hazardous substances and reduction of waste by use of fully recyclable or biodegradable materials. The project addresses this by proposing a universal platform for bio-inspired surface and interface design basing on dopamine, a substructure of adhesive mussel proteins. A multidisciplinary consortium of researchers and industry aims at developing a portfolio of upscalable technologies for the “green” manufacturing of materials for selected applications (antipathogenic coatings, biodegradable energy sources and polymer-metal hybrids as examples for a broad application range) and their recycling or biodegradation and transferring them to mass production. The project out-come will enable European manufacturers to create sustainable production processes and a circular economy of the materials.

KESPER

Kesterite based Photoelectrodes for Water and Nitrogen Reduction

Facing a period of climate emergency and energy crisis, Europe needs to rethink the energy market and the industry with innovative solutions based on renewable sources. KESPER adopts a disruptive approach by tackling simultaneously two of the most critical emerging paradigms: hydrogen and ammonia production. We propose a technology based on light concentrated photoelectrochemical processes that use a novel class of kesterite functional materials, along with tailored surfaces, coatings, and interfaces, resulting in low-cost, earth-abundant, easily recyclable, photoelectrodes, suitable for both H2 evolution and N2 reduction. Our final demonstrator will be developed with scalable techniques, following a life-cycle thinking, without requiring critical or toxic materials, and being capable of producing green-H2 at 19 gH2 h-1m-2 with a production cost of 2.5-5 €/kgH2 and with emissions of 0.5 kgCO2/kgH2, while demonstrating a Faradaic efficiency for N2 reduction of, at least, 50 %.

LaserBATMAN

Multi-scale simulation of laser welding for optimal battery pack manufacturing

The use and production of batteries in the automotive industry began roughly a decade ago with the purpose and aim to produce highway-capable long range electric vehicles. With the current increased demand in industry to produce more efficient energy sources, the manufacturing of electric components need be of high quality and assure the intended performance. This has not yet been fully addressed from an industrial perspective due to short development times. The project will study and optimize joining processes for different stages of battery manufacturing, from battery cells to battery packs. Laser welding is the preferred method of joining and effects related to e.g. residual stress, heat transfer, defects and resulting electrical resistance will be studied and optimized as well. Simulations of the assembled battery packs will enable industry to optimize for example laser process parameters for the joining processes and thereby maximize the efficiency and quality of production.

LASIBAT

Laser-based in-line sintering of adapted ceramic materials for the manufacturing of solid-state battery cells

- The performance of conventional lithium-ion batteries is hindered by some technical and safety limitations. An alternative are solid-state batteries, where a solid electrolyte layer replaces the organic solvent and the separator. However, solid-state batteries are challenging to manufacture. Long sintering steps at high temperatures can cause reduced electrochemical performance.

- In LASIBAT, a scalable inline laser sintering process is developed for the manufacturing of solid-state batteries. Functional ceramic materials are adapted to the new and comparably fast laser sintering method.

- The new processing method is highly relevant for use in production of solid-state lithium-ion batteries for automobile applications or portable devices.

- The project will provide knowledge about the manufacturing of solid-state battery materials which creates great market potential for European battery manufacturers as well as companies producing and developing laser system technology.

LDI MAGIC

Laser Direct Imaging Material and Process Developments for Next Generation Integrated Chipless RFID

The focus of LDI MAGIC is the development and fabrication design of innovative LTCC based mmW RFID-tags which are batteryless and chipless. These can be used for identification and precise localization at the same time, which is not possible in state-of-the-art RFID technology at low cost. The LTCC technology versatility allows the 3D integration of features like dielectric lenses, antenna arrays as well as resonators to store information. For this photoimageable pastes are necessary, which can be structured using laser direct imaging, for creation of very fine metallized structures down to 20 µm line and space it is possible to develop the next generation of RFID tags could support IoT applications, including warehouses, hospitals, logistic hubs (e.g. seaports, airports), industrial

sites, smart cities, and autonomous vehicles using mmW radars that can rely on this approach to localize objects and people with high confidence and perform self-localization with increased reliability.

LIFOMUL 3D

LIgnin FOrmulations for MULtimaterial 3D printing of microneedle electrodes

Additive manufacturing is expected to provide functional multi-materials with micron-scale resolution using environmentally sustainable processes. LIFOMUL 3D will implement the printing via projection-microstereolithography (PμSL) of materials based on lignin, the second-most abundant natural polymer and accumulating as byproduct of cellulose production. The goal is to achieve sub-100 μm feature sizes, biocompatibility and spatially controlled electrical conductivity. Electrocardiography- (ECG) and electroencephalography- (EEG) compatible microneedle electrodes for long term monitoring applications will be printed with superior signal quality and long-term stability. A high-resolution PμSL system will be developed for the hybrid printing of the conductive and insulating resins, eliminating the need for metal evaporation. LIFOMUL 3D will so establish a platform for the additive manufacturing of parts for medical applications with high resolution and obtained from renewable resources.

MAR-WRECK

Development of geopolymer composites as a material for protection of hazardous wrecks and other critical underwater structures against corrosion

The main ambition of the project is to find the cost-effective method, the safe containment of hazardous materials, and eliminate the risk connected with hazardous shipwrecks. The main objective of the project is to develop high-performance composites that have functional properties for engineering applications such as construction and marine industries. Planned result is eco-friendly, high performance composite for underwater applications. It is the answer for need more durable materials for protection the hazardous wrecks and critical underwater infrastructure against corrosion and also for construction purpose in harsh environments, including highly polluted environment, including protection against hazardous cargo in wrecks. The result will be potentially interesting for government institutions planning to increase the activities connected to environmental protection (protection hazardous wrecks) as well as private companies, including underwater works in polluted environments.

MatDeMa

Affordable and Sustainable Multi-Material Lightweight Design and Manufacturing

MatDeMa project will develop a one-step automated (robotized) inline manufacturing process for sustainable net shape Thermoplastic-Fibre Metal Laminate composites. The manufacturing process will be designed to achieve a significant reduction of costs and maximizing material utilisation without reducing parts performances offering new perspectives for large-scale production of these composites for new industrial sectors. The system will be supported by virtual design tools that combine material, structure and process requirements. To improve recycling at end-of-life of hybrid composites, a metal/composite debonding-on-demand mechanisms will be developed. The design for sustainability and circularity will be applied and developed from the concept phase up to

the demonstration to minimise the environmental impact trough Life Cycle Assessment. The project starts at TRL2, the developed concept will be validated on a laboratory pilot line scale and a representative demonstrator at TRL5.

MBrace

Multi-Matrix Composites for Fashionable, Customized and Evolvable Braces

Every year, 22 million Europeans are treated for scoliosis, a spine curvature. The brace treatment is the most effective therapy, but a strain for every child that must undergo it. A brace is worn for years for 23 hours a day and significantly restricts upper body movement. It all happens in a time of self-discovery when opinions of teenage friends count. This project aims to significantly improve the well-being of patients. It combines innovative materials research of functional multi-matrix composites and the development of cost-effective manufacturing technologies with new therapy methods such as machine learning for gait analysis with fashionable design. Flexible elements intend to give the body more range of motion and significantly increase patient compliance. The aim is to transform braces from an uncomfortable fixation device into a supportive aid with high wearing comfort and to change their perception from a medical necessity to a fashionable accessory.

MEDIATE

Semantic-based Material Twin and Co-Simulation Platform for Solid Oxide Fuel Cells

MEDIATE answers a need for an ontology-based, knowledge-assisted method and platform to capture, structure, configure and reuse knowledge for designing materials and engineering systems for electrochemical fuel cells. In parallel, MEDIATE investigates technical problems of industrial and societal relevance that regards improved design, functionally and performance of electrochemical fuel cells. MEDIATE Develops a knowledge-based physical-based and data-driven computational method and platform for modelling and design of electrochemical fuel-cells. The proposed framework uses an ontology-based approach for semantic knowledge management and interoperability.

Potential applications: Design, durability and performance evaluation of electrochemical fuel cells.

Main Impact: Reduction of burden in the design of complex multiscale and multi-physical materials/system and abstraction of the knowledge required for developing new material/product.

Mem4BoTiReg

Biodegradable functionalized Membrane for Bone and Tissue Regeneration

The clinical need to develop a next generation of barrier membranes for active support of the bone regeneration in the alveolar ridge, that combine biocompatibility and patient-specific shape with biodegradable properties, is of great interest. This project aims to develop, characterize and investigate in vitro and in vivo a new volume-stable barrier membrane composed of the biodegradable polymer polylactic acid (PLA), functionalized with bioactive nanoparticles

and the growth factor bone morphogenetic protein 2 (BMP-2). For the computer-aided 3D membranes design, exemplary Cone Beam Computed Topographical images of patients with small bone defects will be used. For the manufacturing of the membranes, both electrospinning and rapid, tomographic volumetric 3D printing were chosen. A major advantage of such membranes would be an active and specific promoting function in the regeneration processes of both bone and soft tissue as well as the exact and stable adjustment in the defect areas.

M-LUGE

Multi-scale laser surface texturing for low ice-friction contacts

Sliding on ice is primarily controlled by the micro topography at the metal-ice interface. This opens the door to design surfaces of different shapes, allowing to control ice-friction performance of functional parts and real-life products. Three universities from Germany and Latvia have teamed up with two application partners to develop a flexible and environmentally friendly laser texturing method for surface functionalization. Laser texturing at three length scales from 200 nm to 100 µm is applied for reliable and long-stable multi-scale features. The goal of laser texturing is to provide low ice-friction and anti-icing functionality on large areas. This is demonstrated by the functional testing of laser textured skeleton runners and slurry-ice evaporators, supporting the European Green Deal by clean energy generation. The range of three laser texturing methods offers unmatched patterning capability and speed for hierarchical topography designs for innovations in surface engineering.

ModEl-FuturE

Modelling Wear of Intrinsically Self-Healing Elastomers for Reduced Particle Emission and Improved Lifetime Performance in Future e-Mobility Concepts

The core innovation objectives of ModEl-FuturE are the creation of novel numerical tools for predictive wear simulations in combination with the elaboration of advanced experimental methods and the development of sustainable soft materials. Specifically, the numerical approaches address a so-called Digital Shadow for tire wear simulations considering damage, healing and abrasion features of a new generation of elastomeric materials. The Digital Shadow is a milestone on the roadmap to create a cyber-physical system. The innovative potential of the project fosters strongly the goals of sustainable develop¬ment, such as a low carbon footprint of product processing and application, which is in line with the topical program. ModEl-FuturE has the potential for significant scientific and commercial impact, for all involved partners, through the generation of valuable intellectual property (IP) guided by a clear plan for the exploitation and dissemination of project results.

NACAB

NAnoCarbon materials for sustainable Battery technology

Lithium is a scarce resource on the Earth's crust and very difficult to recycle, which limits the future scalability of standard battery technologies. The NACAB project seeks to advance the science and technology of carbon-based anode and cathode materials for battery applications beyond Li-ion designs. We will study the intercalation/deintercalation mechanisms for both cations and anions in nanoporous carbon-based materials synthesized from sustainable organic

precursors, as well as integrated hybrid nanocarbon materials, using a tight combination of experiment and simulation: synthesis, electrochemical characterization and machine-learning-driven molecular dynamics. NACAB aims to pave the way for next-generation sustainable and scalable energy-storage solutions beyond current Li-ion technology. This will enable cheap and efficient electrical energy storage and lower our reliance on fossil fuels, bringing us one step closer to the objective of carbon neutrality.

Nano4Glio

Engineered nano-based device for glioblastoma multiforme therapy

Rationale / Needs to be addressed: Glioblastoma (GBM) is an aggressive brain tumour that is incurable, due to drugs' low bioavailability in the brain, and resistance mechanisms. Other limitations such as high toxicity reenforce the need for new therapies.

Objectives: Nano4Glio will develop an implantable device composed of a biodegradable hydrogel incorporating drug-loaded nanoparticles (NPs) for GBM continuous treatment.

Potential applications: The main application is GBM, but treatment of other neurological diseases may be envisaged for future applications since the NPs surface will be modified with a moiety with affinity for the brain.

Impact and potential benefits: This project will deliver a suitable approach to improve GBM therapeutic efficacy, allowing for a continuous and enhanced therapy, without the need for daily administration, while overcoming resistance. Thus, Nano4Glio will deliver a pioneering approach that will be able to overcome the limitations of current therapies.

NanoTRAACES

Ultrasensitive sensors for the detection of Lithium Ion Batteries fails

Lithium-ion batteries (LIBs) represent the largest share of the electrical battery storage of our modern society and are considered to be a valid technology during the next twenty years for plug-in hybrid applications and electric vehicles. One issue in conversion of chemical into electrical energy is that damages such as overcharging lead to fatal composition changes and leaks outside the battery. To respond to the massive societal increasing needs battery safety issues have to evolve to overcome these limitations.

NanoTRAACES aims to develop a novel combined microchip integrable into LIBs for the detection of electrolyte failures. A new concept of sensor based on real-time leakage detection with high sensitivity of chemical changes will be fabricated. A rapid detection of battery electrolyte damage will be achieved to prevent unexpected exothermal reactions. The sensor will also be versatile to implement the concept of online chemical surveillance onto new generations of batteries.

NanOx4EStor

Nanoscaled ferroelectric (pseudo)-binary oxide thin film supercapacitors for flexible and ultrafast pulsed power electronics

Rationale: A rapid market growth for supercapacitors is observed, since commercial dielectric capacitors have a low energy storage density (ESD)<5 Jcm−3 and an operating temperature of 105 0C, thus requiring a cooling system which adds extra weight and volume in power systems.

Objective: NanOx4EStor focuses on the creation of supercapacitors based on (pseudo-)binary oxide thin films, with improved ESD>150 Jcm−3 and operating temperature.

Potential applications: Supercapacitors for pulsed power applications are targeted and will be supported by prototype demonstration.

Impact and benefits: The development of supercapacitors is an emerging market opportunity and companies along the value chain can profit from this growth sector. NanOx4EStor aims to bring innovations to this market and thus, to contribute to a sustainable future and economic growth. The creation of a spin-off for the commercialization of the supercapacitors is envisaged, which will involve guidance from an advisory board.

PHANTASTIC

PHysics- and dAta-driven multiscale modelling desigN of layered lead halide perovskiTe mAterials for Stable phoTovoltaICs

PHANTASTIC aims at providing a multiscale computational materials engineering approach combining data- and physics-driven models for the design of multi-layered lead halide perovskites with improved stability. The materials engineering approach that will be applied relies on the interfacing of 3D lead halide perovskites to properly designed 2D lead halide counterparts. The large chemical space will be explored by training Machine Learning (ML) algorithms against state-of-the-art ab initio molecular dynamics and electronic structure calculations. These will be used in the implementation of a numerical solver coupled with drift-diffusion Poisson equations and the results compared to experimental data provided by advanced experimental characterization tools. A special focus will be devoted to structural rearrangements with time and exposure to environmental factors and light irradiation of 2D, (quasi)2D, 3D lead halide perovskites and their vertical heterostructures.

PIECRISCI

Investigation of Regenerative Effects of CRISPR / Cas9 Functionalized Piezoelectric Nerve Conduits on in vitro and in vivo Spinal Cord Injury Models

Rationale: There is no effective treatment for spinal cord injury (SCI); and long-term personal, social and economic costs are huge.

Objectives: PIECRISCI proposes a material-based treatment for SCI, incorporating exosome/CRISPR/Cas9 complexes into piezoelectric nerve conduits. The system will be tested in vitro, and on in vivo rat SCI models. Gender factors in regeneration will be evaluated.

Potential applications: Loading gene editing cargo in exosomes will provide protection; its release through conduits will allow targeting. The delivery system can be used for other diseases. The in vitro model can be developed further with human cells for personalized treatments. In vivo tests will lay the groundwork for clinical trials.

Impact & potential benefits: The strategy may improve the life standards of SCI patients, and lower treatment costs. Developed in vitro model can be used for pharmaceutical screening of other treatment strategies, and reduce the number of animals used in experiments.

PLASMANODE

Plasma-modified powder materials for Li-ion battery anodes processable by water-based techniques

The project aims at developing eco-friendly negative electrodes for Li-ion batteries by using water-based deposition techniques. To that aim, all materials must be water-compatible: they should (i) resist to water, (ii) be easily dispersible in the water/binder mix to form a homogeneous coating and (iii) keep their cycling properties once processed as electrode.

Negative electrode materials and conductive additives will be carbon-coated using low-temperature plasma (ICS). Silicon (Ferroglobe) and specific TiO2 crystalline forms (TioTech) will be used as active materials. Conductive additives will be commercial carbon blacks and nanotubes. Electrodes will be prepared via a water-based process and their electrochemical performances will be assessed (ULiège). If successful, the overall strategy should be applicable to positive electrodes. Besides environmental impacts, replacement of organic solvents by water should also lead to significant decrease in electrode processing costs.

Pompey

Polymer-Metal 3D Printing using Hybrid Material Extrusion

Additive manufacturing technologies enable not only the flexible manufacturing of customized products, but open new opportunities for integration of electronics into the structure of the component. Today´s challenges include multi-material processing, quality monitoring, reliability, and productivity. Main objective of the Pompey project is a hybrid manufacturing device, enabling FFF printing processes for polymers and material extrusion for low melting point metal alloys. New sensor systems, data collection and analyis improve the quality of the printed marts. Results are manufactured and repaired parts such as PCBs and electronic devices. The project favours environmental aspects, including resource and energy efficiency and repair, and promoting circular economy aspects. The project´s outcome will be beneficial in strengthening the partner´s position in existing applications and reaching industries not yet exploited.

PORMETALOMICS

Porous Metal Genomics for Tailoring Mechanical Properties of Light-weight 3D-Printed Architectures

Porous metals are increasingly important in technology. Due to their tunable mechanical properties, they are promising candidates in various emerging applications such as metallic scaffolds for load-bearing bones, lightweight structures for transport technologies, electrodes for electrochemical energy storage devices, and more. This project aims at developing a computational model to establish a quantitative understanding of the relations between the enormous variety of possible morphologies of porous structures and their mechanical properties. The machine-learning-based model will be employed to identify various prototype structures of new morphologies via the implementation of hierarchical screening and a material genome approach. The optimal and/or statistically relevant structures will be 3D printed and tested mechanically in experiments, with the results contributing to both tuning and validation of the computational designs.

PowderEUse

Novel method of polyamide powders reconditioning for re-use in selective laser sintering process

Selective laser sintering (SLS) is an additive manufacturing technology, also known as 3D printing, where a polymer powder is added layer by layer and then melted by a laser beam. The feedstock material in the SLS is mainly polyamides, which represent more than 90% of the market today (polymer powder market reached $539m in 2019). During the production process, only about 10% of the volume of the working chamber is used, and the main drawback is the inability to directly reuse the material because of chemical changes due to thermal degradation. The goal of the project is to demonstrate the ability to regenerate waste powders in SLS and obtain ready components with acceptable characteristics, while reducing costs for short production runs. This solution is primarily a new approach in the field of environmental protection, which allows the elimination of post-process waste to a large extent and is an important aspect in the industry in prototypes and tooling production, consumer goods.

PRINTCAP

Next generation of 3D printed structural supercapacitors

E-mobility systems require the provision of efficient, light and durable battery solutions. However, current state-of-the-art batteries add a significant amount of weight reducing the potential panel of applications. Novel solutions for efficient energy storage that address the combination of supercapacitors (SC) performance and structural capabilities, reducing the weight as function of the energy stored, is a major potential breakthrough in the field. This concept of a “structural SC” could have a large panel of applications on huge markets, not only for transport/mobility: portable electronics, rapidly charging electric car that stores power in its own chassis, or all-electric aircraft with energy is stored in the fuselage. In contrast to already published SSC concepts, PRINTCAP will focus on additive manufacturing to produce SSC that geometrically placed close to the shape of the final product. Recycling issue and Life-Cycle Assessment (LCA) studies will be also taken into account.

RePark

Refining the efficacy of systemic administration of bioactive molecules for Parkinson's Disease

Parkinson's Disease (PD) is a neurodegenerative disease primarily linked to ageing affecting the psychomotor functions. An impairment in the activity of dopaminergic neurons (aggregation and intracellular accumulation of alfa-synuclein), is at the basis of this functional loss. Current therapies do not revert the PD progression but stand on the relief of the symptoms. Importantly, the efficacy of new therapeutic approaches is hampered by the lack of in vitro models that mimic the PD's hallmarks. Moreover, the effectiveness of therapeutic approaches is hampered by the low ability of the drugs to cross the blood-brain barrier (BBB). RePark will develop an in vitro PD model that combines a mimic of the BBB, the brain's extracellular matrix (ECM) and brain cells. With this system it will be possible to overcome the disadvantages of using animal models and to recapitulate in vitro the cellular characteristics of PD, as well as to assess the delivery and efficacy of new therapeutic drugs.

RESTINA

Recovered Silicon / Tin Sulphide Nanocomposite Anode Materials for Generation 3b Lithium Ion Batteries

RESTINA is motivated by the need to develop high-performance LIBs for battery electric vehicles using advanced materials that deliver high specific and volumetric energy densities, long-term cyclability, safety and environmental sustainability. The objectives are to design novel, low-CRM Si/SnS2 nanocomposite anode materials with protective carbon-based coatings and to upscale the synthesis, coating, and electrode manufacturing to the semi-industrial level using green processing methods.

- The use of high-capacity Si and electronically conductive Sn with sulphur will create a new class of nanocomposite anode active materials with high capacities and long lifetimes

- Carbon-coated Si/SnS2 nanocomposites are stable in air and can be processed in aqueous slurries.

- The Si/SnS2 nanocomposites are sustainable due to the low amounts of carbon used and by reinvesting the energy costs for preparation of solar and electronic grade Si into battery component development.

SanFlex

Antipathogenic touchscreen polymer films

The project aims to reduce healthcare-associated infections (HAI) by developing antipathogenic, flexible and transparent plastic films for touchscreens and displays. The project combines several intertwined activities: (i) Synthesis of dual functional antipathogenic photocatalytic and surface functionalized coating using up-scalable sputtering technologies and a reactive gas-phase photo-fixation process, (ii) transferring the technology onto a flexible polymer film, (iii) In-depth analysis of user needs and options for implementation in healthcare processes as well as socio-technical aspects, (iv) development of solutions for deployment of the innovation in hospitals to mitigate HAIs, and (v) clinical evaluation of the results. A successful project would pave the way for safer healthcare facility. HAIs can occur in any healthcare facility. About 4m people acquire HAI per year in Europe, and is the single most deadly and costly adverse event, using up to 6% of public hospital budget.

-SMILE-

Surface coating and MIcrostructuring for compound functionaLisEd biomaterials in dentistry

Due to constantly increasing aesthetic requirements of patients in dentistry/orthodontics, new materials/material combinations, which can be used in the oral environment, are attractive, since ceramics, as an aesthetic material is unaccountable, for example, due to the risk of enamel abrasion especially in the lower jaw. The project aims to fabricate new functionalized multi-material brackets (metal/polymer) for orthodontic application, enhanced by an additive manufactured metallic micro-topology interface for second material (polymer) adhesion giving the bracket the final shape. Furthermore, an anti-microbiological coating with caries protective potential to overcome the drawbacks of the polymer will functionalize the composite material surface of these braces, which will then be evaluated in-vitro and in-vivo for their mechanical and biological properties and the influences and behaviour in the oral environment, proving the high benefit for patient's aesthetics and treatment safety.

SOLIMEC

Enhancing the mechanical stability of interfaces in solid-state Li-ion batteries for energy-intensive applications

The climate conference in Glasgow 2021 emphasized the importance of reducing CO2 emissions. This endeavor requires a more significant step towards sustainable energy sources and storage. The rationale for this project is to improve the next generation of emerging solid-state Li batteries (SSLBs), which can eliminate hazards and energy density issues associated with conventional liquid electrolyte-based Li-ion batteries (LIBs). To achieve this goal, five leading research groups and a large technological company in the EU have developed the following strategy to face the current challenges of SSLBs. We rely on multicomponent engineering of cathode material and its interface with the solid-state electrolyte to prevent stress-induced loss of contact during charge/discharge, which degrades electron/ion transfer, and thus improving the SSLB performance and longevity. Potential benefits are seen in the application of SSLB as true alternative to LIB to replace fossil fuels in the car industry.

SPIRIT

Solid state Potassium-Ion batteRIes for safe and susTainable energy storage

SPIRIT consortium is composed of 1 university, 3 research centers and 1 SME with the objective to develop the next generation of energy storage devices, a solid-state Potassium-ion battery (TRL4) based on safe, sustainable and cost-competitive anode, cathode and novel polymer electrolyte materials. The solid-state batteries developed within SPIRIT would find applications in large-scale energy storage coupled to production of renewables in sun or wind farms, light electromobility and in medium and small size, remote, off-grid energy storage. The societal and economic impact is expected to be substantive, eliminating the need of hazardous (Pb, LiPF6, flammable solvents) and critical raw materials (Co, Li, graphite) from our widespread energy storage devices and creating a sustainable European battery technology. This will enable safer and more affordable energy storage devices (SDG7) that help in the transition towards a zero-carbon emission energy future in the EU.

SuperSuper

Alternative Superconducting Superlattices

Moiré materials have emerged as a two-dimensional platform with a broad range of states between superconducting and insulating. Despite the remarkable scientific progress, an important bottleneck is the lack of a general and facile approach for the production of moiré materials. SuperSuper is targeted at developing a disruptive straightforward bottom-up approach to prepare highly-crystalline moiré materials, which will exceed the current challenges and limitations of existing materials and methods, and also, at establishing Proof-of-Principle of their technological potential. Achieving this would represent an important step forward in the design of the next generation of superconductors.

SuSaNa

Sustainable and Safe anode-free Na battery

In the near future the market is going to need large amounts of batteries that require to be sustainable and safe. SuSaNa project aims at developing a sustainable, safe, and high energy density Na-based battery. The focus is put on: (i) formulate novel non-flammable electrolytes with high efficiency of Na plating-stripping, to supress dendrite growth becoming safe, (ii) development of anode-free cells that provide high power and high specific energy, and (iii) using a highly performing patented cathode, Prussian white. Moreover, key processes, products and materials are to comply with Green Chemistry and Green Engineering principles, and Ecodesign concepts including recyclability aspects that will be proposed at early TRLs.

To achieve the challenging goals an outstanding consortium from 4 countries has been gathered, with research institutions and universities (Uppsala Univ., DTU, FZ Jülich), start-ups (Altris & PhaseTree) and a recycling company (ACCUREC) led and coordinated by CSIC.

SUSTBATT

Scalable Sustainable Anodes for Li-ion Batteries by Structural Design

Due to their potential to contribute to zero-emission mobility and storage of renewable energy, Lithium-ion batteries are a technological pathway to climate-change mitigation and energy sustainability. To achieve this, sustainability of battery raw materials is a must. SUSTBATT aims to produce scalable and sustainable high-capacity Si-based anodes through the cultivation of diatoms, a type of photosynthetic algae that synthesize hierarchical nanostructured SiO_2 skeletons through biomineralization. With a landmark of 840 mAhg-1 after 100 cycles (at 100 mAg-1) using diatom-SiO_2, this project aims to exploit the full potential of diatom feedstock by adjusting Si/SiO_2 ratio in SiO_x structures. Relying on a structural design of the anodes, the main goal of SUSTBATT is to reach stable storage capacities of 1500 mAhg-1 after 1000 cycles (at 100 mAg-1) in upscaled full-cells. This will pave the way for the innovative integration of sustainably sourced feedstock into the battery technology.

TARDIS

Nano-enabled stimuli-responsive scaffolds for targeted antimicrobials delivery to treat Staphylococcus aureus infections and restore skin homeostasis

Skin infections have a significant impact on human health, especially when they cause disability and disfigurement. Treatments using antibiotics not only select for antimicrobial resistance, a global healthcare treat and heavy economic burden, but also disrupt the protective skin microbiome promoting new or recurrent infections. TARDIS will develop innovative antimicrobial hydrogel scaffolds of targeted bio-based nanoactives with high bactericidal efficacy towards Staphylococcus aureus, the most common skin pathogen, and ability to maintain the beneficial microbial balance and physiological functions of the skin. The environmental and societal impacts of the technologies and products will be considered during the whole lifecycle. The exploitation strategy will harmonize the needs of the society and business in the long term. TARDIS multidisciplinary scientific knowledge and technologies will be easily implemented for a broad range of applications from healthcare to astronomy.

Thermos

Tellurium-Free Thermoelectric Modules by Interface Engineering

Thermoelectric (TE) technology offers solutions to solid-state heat recovery and cooling. Till now, only Bi2Te3 modules are commercially mature. Their applicability is limited by the scarcity and toxicity of tellurium (Te) with a concentration of <0.001 ppm in the earth's crust. The replacement of Te will be addressed by THERMOS. As major objective THERMOS will develop highly efficient modules using atomic layer deposition and Te-free Zintl materials with a conversion efficiency of 8.5% and a cooling temperature of 65˚C to outperform Bi2Te3 modules. THERMOS will enable novel applications such as powering off-grid Internet-of-Things (IoT) nodes, energy harvesting from low-grade waste heat or cooling of medical devices. Joint efforts of research institutes from Germany and Spain, one university from the Czech Republic, and the Danish company TEGnology will impact the development and production of next-generation TE modules "Made in Europe" with better sustainability and performance.

TOPCAPI

Advanced cutting Tools of predictable life with OPtimized Coating-substrate combination to be APplied in the Industry for machining of stainless steel

Stainless steels have been widely used in various industrial sectors including aerospace, automotive, biomedical, pumps, gas, heating, ventilation, and air conditioning. To fabricate these components, the most common way is to use convenient machining processes. As machining of such materials are difficult and resulting in short life for cutting tools due to its physical and mechanical properties, it needs special attention. TOPCAPI focuses on the new approaches that will provide methodology for developing advanced cutting tools for drilling operations with predictable life by optimizing coating-substrate combination and, also the geometry of cutting tools. Developed drill bits will find high potential to be used in machining stainless steel industry in Europe. Developed cutting tools will certainly eliminate invisible or indirect consequences of unpredictable tools that are overall equipment effectiveness, ppm defective part rate, and more importantly customer loyalty.

VENUS

Anti-calcification treatment of elastin-rich bioprosthetic materials using Fetuin A for aortic valved conduits

Cardiovascular diseases are one of the main causes of death in the world. Aortic valve defects strongly contribute to these statistics leading to heart valve repair or replacement. Biological heart valve bioprosthesis made of porcine or bovine tissue are promising, however their lifetime is limited by 10 - 12 years due to calcification process. Especially for materials with a high elastin content conventional pre-treatment do not solve a problem of calcification. VENUS aims to develop a pre-treatment method for anti-calcification of elastin-rich xenogenic materials using Fetuin A, a natural anti-calcification serum protein. The effectiveness of the proposed technology will be demonstrated on right-sided aortic valved conduits fabricated from bovine jugular vein. The successful implementation of the project will lead to a competitive technology in interventional cardiology with a high public value and commercialization potential.

ZABAT

Next generation rechargeable and sustainable Zinc-Air batteries

Energy Storage technologies are essential to reach the mid- (2030) and long-term (2050) EU climate and energy goals. Particularly, batteries are crucial to include renewables (wind, solar…) into the EU grid. Hence, for the stability and security of Europe's energy supply. Aligned with that, ZABAT will develop and validate a rechargeable Zn-Air battery to enable cost-effective behind the meter energy storage applications for industry and household coupled with renewables. ZABAT aims to develop a critical material free energy storage system, with at least 300 Wh Kg-1 and > 2,000 hours cycle life. The technology is based on abundant Zn, thus reducing the use of CRMs (i.e., lithium, natural graphite and cobalt) while promoting the circular economy, as set by the United Nations in the sustainable development goals. ZABAT will also address environmental, toxicity, and societal impact of the materials and processes related to r-ZAB technology through sustainable and circularity assessments.

ZABSES

Zinc-Air Battery for the Stationary Electricity Storage

The storage of electricity produced by intermittent renewable sources is the bottleneck of the transition towards a fully green energy landscape. Battery technologies applied to buffer the mismatch electricity production / demand have to comply with very tight economic constraints to be competitive with fossil fuel combustion technologies. Issues related to critical raw materials are now at the forefront of the discussions and need to be addressed natively to any battery technology to be developed. The ZABSES project aims at demonstrating that a rechargeable alkaline zinc – air battery (ZAB) technology, made of abundant, environmentally friendly, intrinsically safe and robust materials, without issues for recycling step and presenting auspicious life cycle costs, can be a suitable solution. An integrated approach, joining experimental works and computational modelling, will be adopted to develop cutting-edge materials, electrode architecture and electrode compositional characteristics.