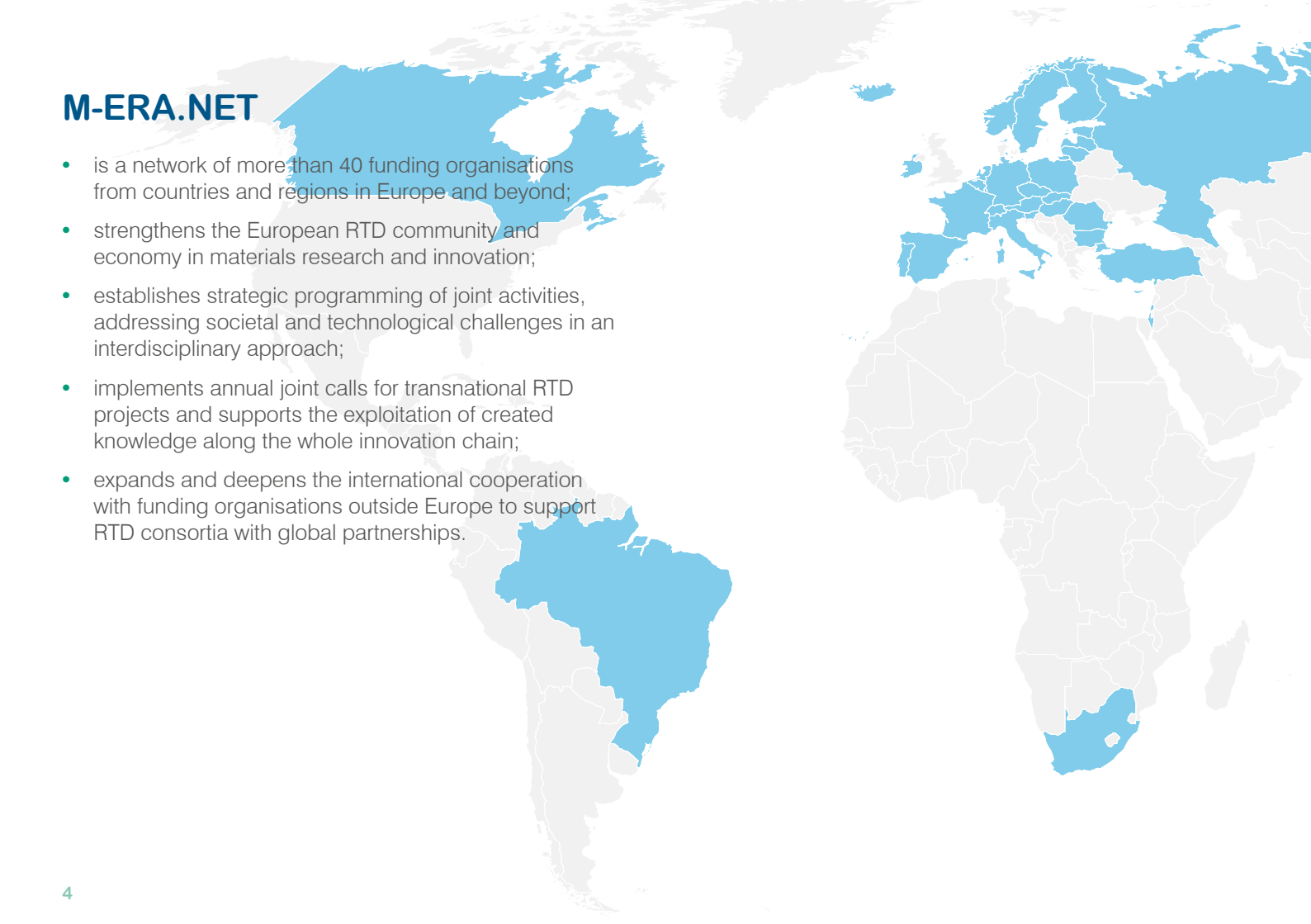
M-era.Net

SUCCESS STORIES BOOKLET 2

CONTENTS

M-ERA.NET

- is a network of more than 40 funding organisations from countries and regions in Europe and beyond;
- strengthens the European RTD community and economy in materials research and innovation;
- establishes strategic programming of joint activities, addressing societal and technological challenges in an interdisciplinary approach;
- implements annual joint calls for transnational RTD projects and supports the exploitation of created knowledge along the whole innovation chain;
- expands and deepens the international cooperation with funding organisations outside Europe to support RTD consortia with global partnerships.



WHAT IS THE M-ERA.NET?

M-ERA.NET is an EU funded network which has been established in 2012 to support and increase the coordination of European research and innovation programmes and related funding in materials science and engineering. Between 2016 and 2021 and beyond, the M-ERA.NET consortium continues to contribute to the restructuring of the European Research Area (ERA) by operating a single innovative and flexible network of national and regional funding organisations. M-ERA.NET contributes to EU policies and is complementary to funding schemes at regional, national and European levels, supporting the exploitation of knowledge along the whole innovation chain from basic research to applied research and innovation. By stimulating scientific excellence and the creation of a new innovation oriented economy, M-ERA.NET will deliver lasting impact and significant breakthroughs. M-ERA.NET aims to develop a long-term cooperation between funding organisations from countries and regions across Europe and beyond.

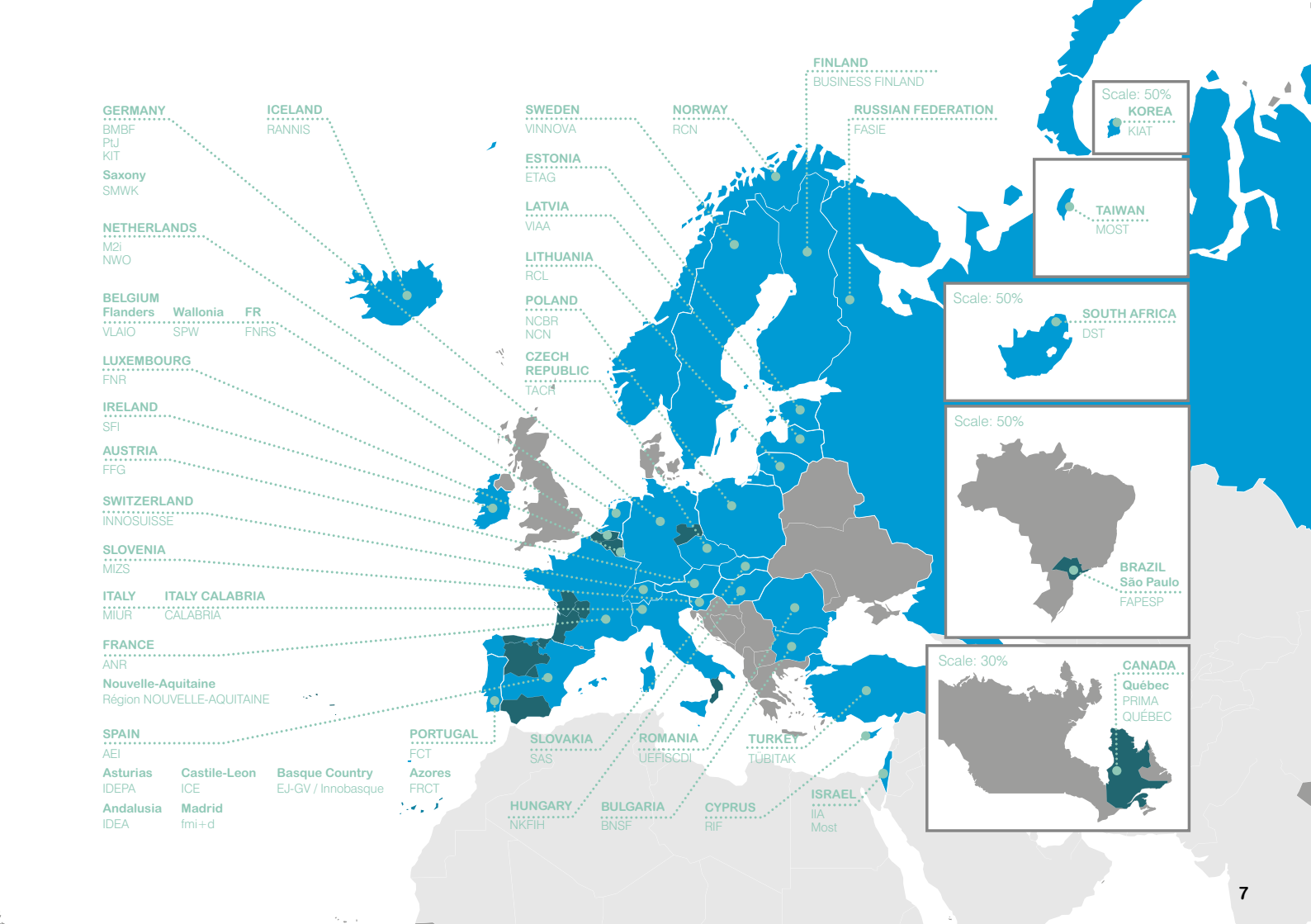
WHY FUNDING ADVANCED MATERIALS TECHNOLOGIES

Advanced materials technologies are classified as Key Enabling Technologies (KET) with a wide range of product applications such as developing low carbon energy technologies and improving energy and resource efficiency. They have huge potential to fuel economic growth and provide jobs. In recent years, significant efforts were made to support industry in coping the challenges it currently faces: new materials for specific applications, meeting the economic and ecological demands of circularity and the requirement for enhanced integration of products and processes. Europe has a wealth of academic and industrial expertise. In order to ensure that Europe stays at the forefront of developments, it is crucial to have a strategic programme that helps to develop projects with impact on a global scale.

JOINT CALLS

The objective of the M-ERA.NET Calls is to enable transnational R&D projects between partners receiving funding from regional/national programmes. Benefits are combined in one approach: On the one hand the regional/national funding organisations apply their own well-established funding rules and procedures known to their applicants, and on the other hand the M-ERA.NET provides transnational coordination expertise. The funding organisations decide on a yearly base about their participation in the annual calls. Since a variable geometry in the implementation of the transnational joint calls is offered, funding organisations beyond the M-ERA.NET consortium may join the annual calls.

More details are available via our website:
https://m-era.net/joint-calls


GERMANY
BMBF
PtJ
KIT
Saxony
SMWK
ICELAND
RANNIS
NETHERLANDS
M2i
NWO
BELGIUM
Flanders
VLAIO
Wallonia
SPW
FR
FNRS
LUXEMBOURG
FNR
IRELAND
SFI
AUSTRIA
FFG
SWITZERLAND
INNOSUISSE
SLOVENIA
MIZS
ITALY
MIUR
ITALY CALABRIA
CALABRIA
FRANCE
ANR
Nouvelle-Aquitaine
Région NOUVELLE-AQUITAINE
SPAIN
AEI
Asturias
IDEPA
Castile-Leon
ICE
Basque Country
EJ-GV / Innobasque
Andalusia
IDEA
Madrid
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PORTUGAL
FCT
Azores
FRCT
SWEDEN
VINNOVA
NORWAY
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TACR
SLOVAKIA
SAS
ROMANIA
UEFISCDI
TURKEY
TUBITAK
HUNGARY
NKFIH
BULGARIA
BNSF
CYPRUS
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ISRAEL
IIA
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Scale: 50%
KOREA
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MOST
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SOUTH AFRICA
DST
Scale: 50%
BRAZIL
São Paulo
FAPESP
Scale: 30%
CANADA
Québec
PRIMA
QUÉBEC

HIGH PHOTOCONDUCTIVE OXIDE FILMS FUNCTIONALIZED WITH GeSi NANOPARTICLES FOR ENVIRONMENTAL APPLICATIONS – PHOTONANOP

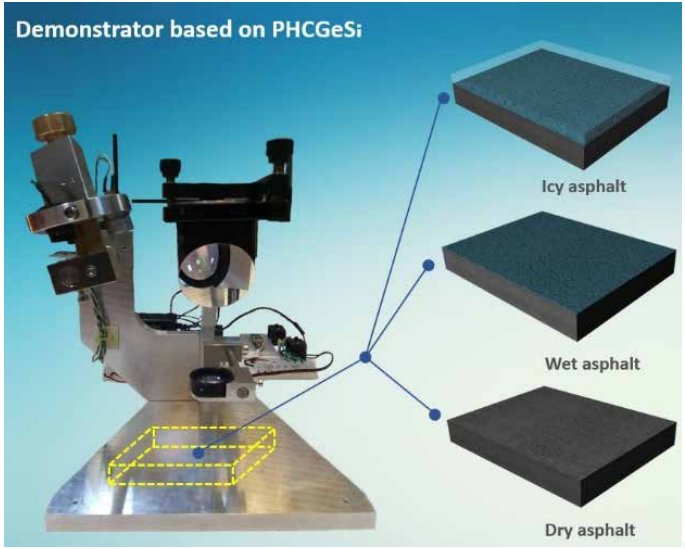
The project proposes a new solution for obtaining a new advanced material with targeted photoconductive (PHC) properties. The goal is to obtain oxide films (TiO2, SiO2) functionalized with GexSi1-x nanoparticles (NPs), photosensitive in the 0.6–1.2 μm spectral range (called PHCGeSi films). For proving the project concept, we fabricated an optical sensor-like as demonstrator, based on PHCGeSi films, that is able to evaluate slippery road conditions by spectrally discriminating between dry, wet and icy asphalt.The innovative results achieved in the project are:

- functionalized oxide films with GexSi1-x NPs that are able to control the spectral range of sensitivity by engineering NPs sizes, composition aand concentration;
- modelling of PHC properties for predicting the spectral sensitivity with a feedback to the structure and morphology of films;
- fabrication of PHCGeSi film-based demonstrator with the targeted PHC properties. At present, for evaluating different slippery road conditions, InGaAs and Si photodetectors (comercial) are used. The PHCGeSi films have advantages of the sensitivity beyond $\lambda > 1.1$ μm Si edge, environmentally friendly and raw materials and technology are less expensive than current photodetectors.

During the project, the partners have published 7 ISI papers (and other 2 are ready for submission), a patent application (and other one in preparation) and 11 oral presentations at prestigious international conferences and symposia, from which we highlight the following:

- A.-M. Lepadatu, A. Slav, C. Palade, V.S. Teodorescu, M. Enculescu, S. Iftimie, S. Lazanu, M.L. Ciurea, T. Stoica, Sci. Rep. 8, 4898 (2018);
- M.T. Sultan, A. Manolescu, J.T. Guðmundsson, K. Torfason, G.A. Nemnes, I. Stavarache, C. Logofatu, V.S. Teodorescu, M.L. Ciurea, H.G. Svavarsson, Appl. Surf. Sci. accepted for publication in 2018;
- Stavarache, V.A. Maraloiu, C. Negrila, P. Prepelita, I. Gruia and G. Iordache, Semicond. Sci. Technol. 32, 105003 (2017);

- Patent application OSIM nr. A 00069/09.02.2017 (and other 1 is finished and ready for registration)



PROJECT DETAILS

Call	Call 2014
Call Topic	Funtional Materials focusing on Sensors
Duration	36 months
Partners	National Institute of Materials Physics, Romania (Coordinator) National Institute for R&D in Microtechnologies, Romania (Partner) Reykjavik University School of Science and Engineering, Iceland (Partner) OPTOELECTRONICA-2001 S.A, Romania (Partner) Pi Technology, Iceland (Partner)
Total project cost	€ 601,800
Contact	National Institute of Materials Physics Atomistilor 405A, Ilfov County, Romania Prof. Dr. Magdalena Lidia Ciurea E-mail: ciurea@infim.ro
Project website	infim.ro/en/project/high-photoconductive-oxide-films-functionalized-with-gesi-nanoparticles-for-environmental-applications-photonanop

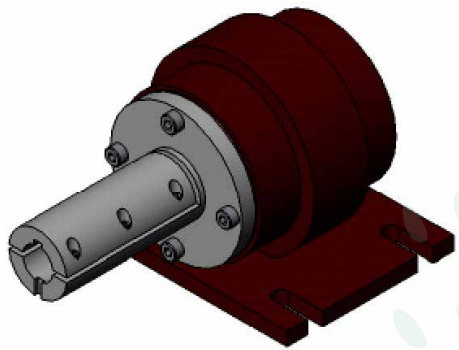
Project Consortium details via Link to ERA-LEARN

NEW DOPED BORO-PHOSPHATE VITREOUS MATERIALS, AS NANO-POWDERS AND NANO-STRUCTURED THIN FILMS, WITH HIGH OPTICAL AND MAGNETIC PROPERTIES, FOR PHOTONICS – MAGPHOGLAS

Transition, post-transition and rare earth doped boron-phosphate glasses were designed, modeled and made in the form of block and thin layers. The technological process for obtaining the block glass was established by wet production of the mixture of raw materials followed by melting and annealing. Transition, post-transition and rare earth ions doped boro-phosphate glass were designed, modeled and realised as MS (Magnetron Sputtering) and PLD (Pulsed Laser Deposition) targets. Sol-gel samples from doped and undoped boro-phosphate binary systems were made and the thermal treatment for their preparation as powder was established. Films were deposited on borosilicate and silica glass substrate by spin-coating method. Films from two types of targets made by own efforts were deposited by PLD method, on borosilicate and quartz glass substrates as well as on silicon. Meta-surfaces were initiated by depositing ultra-thin layers of nm thickness, on and from doped boro-phosphate glasses, in various mono and multilayer variants, with the use of boron-phosphate doped with terbium and dysprosium oxides targets and Ag target. The structure and properties of the samples were investigated by UV. The most relevant result obtained by the project is the obtaining of bulk boro-phosphate glasses containing lithium oxide, aluminum oxide and zinc oxide and doped with transition and post-transition ions pairs or with rare earth ion pairs, with the following characteristics:

- High homogeneity in the entire volume of the glass
- Lack of flaws or stones
- Low number of gaseous inclusions and very small dimensions of them
- Lack of defects of the type of striations, thread, cords
- Lack of tensions due to thermal gradients
- Optical transmission in visible up to 80% or more (also for near UV or near IR)
- Optical magneto-optical effect, rotation of the polarized light plane, comparable to that indicated by the data from the literature, as well as the process of manufacturing such glasses with magneto-optical properties.

The main novelty of the project's results is that new vitreous materials have been obtained with magneto-optical uses, combining the properties of phosphate glasses with the advantages and novelty of the introduction of B_2O_3 and ZnO. The dopants, transition metals, post-transition metals and rare earths oxides provide high magneto-optic properties for these glasses, which have the advantages of combining these properties with high chemical and mechanical stability. New scientific fields were initiated in Portugal and the Republic of Moldova and the Faraday rotator prototype was developed at SITEX partner. Dissemination of research results was achieved. See publication list: www.inflpr.ro/en/node/1169. The SITEX Partner filed a patent application at Romanian Office for Patents OSIM. The INFLPR Coordinator filed a second patent application at OSIM.



PROJECT DETAILS

Call	Call 2012
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	National Institute for Lasers, Plasma and Radiation Physics, Romania (Coordinator) SC SITEX 45 SRL, Romania (Partner) New University of Lisbon, Faculty of Science and Technology-I3N/CENIMAT, Portugal (Partner)
Total project cost	€ 370,000
Contact	National Institute for Lasers, Plasma and Radiation Physics Atomistilor Str. 409, PO Box MG-36, Jud. Ilfov; 077125 Magurele, Romania Bogdan Alexandru Sava Phone: +40 728062160 E-mail: savabogdanalexandrau@yahoo.com
Project website	www.inflpr.ro/en/taxonomy/term/71

Project Consortium details via Link to ERA-LEARN

SURFACE MODIFICATIONS TO CONTROL DRUG RELEASE FROM THERAPEUTIC OPHTHALMIC LENSES – SURFLENSES

The SurfLenses project aimed to develop new efficient drug delivery systems for the treatment/prophylaxis of ocular diseases and post-surgical infections, mainly through the coating/surface modification of drug-loaded soft contact lenses (SCLs) and intra ocular lenses (IOLs). These devices, still inexistent in the market, have raised great interest among the research community and ophthalmic lens manufacturers and are expected to bring numerous advantages at the clinical level. They shall have a positive impact on people's quality of life, comfort and working ability at long term, contributing for the "Active and Healthy Ageing" which has been elected by the European Union as global priority. To achieve the project purposes, it was gathered an international multidisciplinary team (from Portugal, Belgium and Iceland) of experienced and young researchers from academy, clinics and industry, with complementary skills/expertise in areas like biomaterials, chemistry, pharmacy/drug delivery, microbiology, biomedical engineering and ophthalmology.

The project stood out by its high level of productivity, that surpassed largely the expected indicators. It gave rise to high quality and innovative work and contributed significantly to the advanced training of young scientists. Overall, SurfLenses project led to the publication of 17 articles in indexed reputed scientific journals, 1 publication in a scientific bulletin, 54 communications in national and international scientific meetings, 10 invited communications, 3 PhD thesis already finished and 2 in progress, 14 MSc thesis, 2 summer internships, 5 research grants and 1 new project in a related theme involving several partners from Portugal and Brazil. It also contributed to the success of 1 IF2014 Principal Researcher position application. More details about the project at: **surflenses.wixsite.com/surflenses**

SurfLenses

PROJECT DETAILS

Call	Call 2012
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	39 months
Partners	Instituto Universitário Egas Moniz, Portugal (Coordinator) University of Coimbra, Portugal (Partner) University of Iceland, Iceland (Partner) Physiol, Belgium (Partner) Altakitin, Portugal (Partner) Hospital das Forças Armadas, Portugal (Partner)
Total project cost	€ 730,000
Contact	Instituto Universitário Egas Moniz Campus Universitário Egas Moniz, Quinta da Granja, Monte de Caparica, 2829–511 Caparica Ana Paula Serro E-mail: anapaula.serro@ciiem-egasmoniz.net Phone: +351 218419240
Project website	surflenses.wixsite.com/surflenses

Project Consortium details via Link to ERA-LEARN

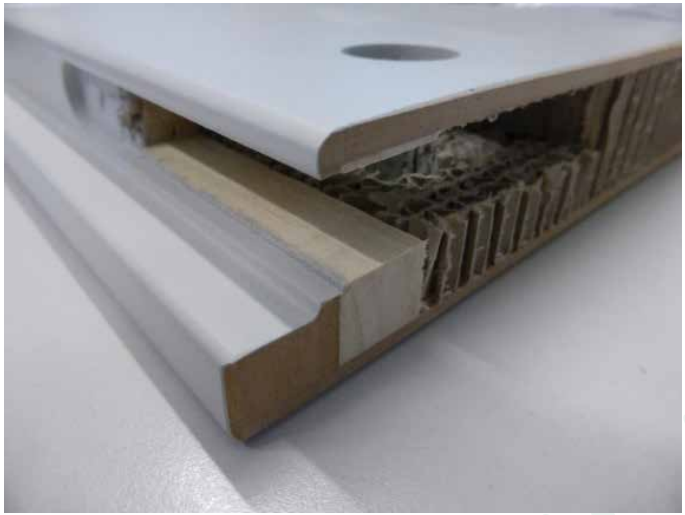
DECORATIVE FUNCTIONAL COATING AND/OR PRINTING OF NATURAL FIBRE/WOOD-BASED LIGHTWEIGHT COMPOSITES USED FOR ECO-FRIENDLY FURNITURE APPLICATIONS – ECOFURN

Today the powder coating medium density fibre boards (MDF) technology can be seen as niche technology in the decorative coating market for wood-based furniture applications due to its limitation to the special designed MDF substrates. Other wood-based light-weight panels cannot be powder coated yet. The general aim of the project was to increase the know-how of the sustainable eco-friendly decorative powder coating by the identification, development and modification of light-weight natural fibre/wood- based composite materials suitable for powder coating, the necessary modification of the powder coating process for these substrates and the development of a functional decorative digital electrophotographic printing process on these materials for design individualization. During the course of the project, it has been possible to demonstrate that other temperature-sensitive materials, such as lightweight boards, can be powder coated and printed. Solutions for manufacturing powdercoatable lightweight components have been developed and the powder coating process for these lightweight materials has been modified because they behave differently when exposed to heat during the curing phase in the oven. The research has demonstrated that these lightweight materials heat up much more quickly in the infrared oven than MDF substrates, because of their low weight per unit area. As a result, the oven parameters need to be amended for these new materials in order to produce highquality coatings.

The results of the work have been published:

1. Developments and trends in powder coating of heat-sensitive substrates, PTF BPI 2014 CONFERENCE (Sept. 2014, A-Kuchl);
2. Decorative Functional Powder Coating of Wood-based Lightweight Composites used for Eco-friendly Furniture Applications, Decorative Surface Conference 2016 Decorative Surfaces Conference, April 6–7, 2016, Leipzig;
3. Decorative Surfaces Conference 2016 in Leipzig, WOODKPLUS News (Kompetenzzentrum Holz GmbH; 201. Ausgabe, 14.04.16);
4. Pulverlacke auch für Leichtbauplatten, Journal für Oberflächentechnik (JOT 5.2017);
5. Powder Coating Lightweight Boards, International Surface Technology (IST 2.2017 Volume 10;

6. Pulverlacke auch für Leichtbauplatten – Entwicklung von Prozessen und Substratmaterialien für die Pulverbeschichtung von Leichtbauplatten, EPS – Der Pulvertreff 2018, 16.10.2018–17.10.2018 – München, Deutschland



PROJECT DETAILS

Call	Call 2013
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	Kompetenzzentrum Holz GmbH, Austria (Coordinator) Tiger Coatings GmbH und CoKG, Austria (Partner) Berner Fachhochschule, Switzerland (Partner) Ramseier Woodcoat AG, Switzerland (Partner) J. Wagner AG, Switzerland (Partner) Sauter GmbH, Germany (Partner) Vitra Factory GmbH, Germany (Partner) Fritz Egger GmbH & Co, Germany (Partner) Heraeus Noblelight GmbH, Germany (Partner)
Total project cost	€ 867,984
Contact	Kompetenzzentrum Holz GmbH Altenberger Straße 69, 4040 Linz, Austria Christoph Jocham E-mail: c.jocham@kplus-wood.at

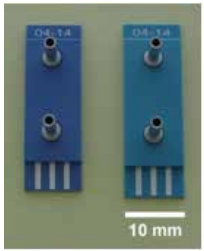
Project Consortium details via Link to ERA-LEARN

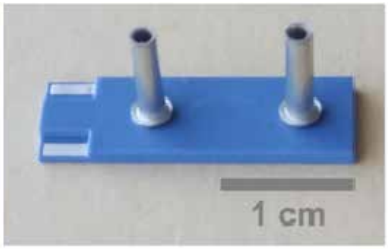
INTEGRATED SENSORS WITH MICROFLUIDIC FEATURES USING LTCC TECHNOLOGY – INTCERSEN

The main focus of the INTCERSEN was the development and fabrication design of innovative ceramic microfluidic devices with integrated sensing features with applications on bio-medical, environment and security. The LTCC technology versatility allowed the 3D integration of electrochemical sensing areas with microfluidic features and advanced signal processing and wireless communication. Several experimental models of integrated sensors have been developed. The main results of the project can be found in the list of our publications:

1. R. Ciobanu, C. Schreiner, V. Drug, T. Schreiner, D. Antal, “Sensors in LTCC-Technology with Embedded Microfluidic Features, for Medical Applications”, IEEE International Symposium on medical Measurements and Applications (MEMEA 2015, Torino, Italy, May 2015;
2. R. Ciobanu, C. Schreiner, “LTCC/PZT Technology for Automotive Actuator and Sensor Applications”, ACEMP-OPTIM-Electromotion Joint Conference, Side, Turkey, september 2015;
3. C. Schreiner, R. Ciobanu, A. Iavorschi, P. Fanjul Bolado, “Design of Sensors in LTCC-Technology with Embedded Microfluidic Features”, 51st International Conference on Microelectronics, Devices and Materials (MIDEM 2015), Bled, Slovenia, September 2015;
4. H. Ursic, B. Malic, D. Belavic, M. Jerlah, A. Bencan, K. Makarovic, C. Schreiner, R. Ciobanu, I. Mercioniu, P. Fanjul Bolado, “Integrated Sensors with Microfluidic Features Using LTCC Technology”, M-ERA-NET Conference 2015 at the EMRS 2015 Fall Meeting, Warsaw, Poland, September 2015;
5. C. Schreiner, R. Ciobanu, I. Mercioniu, T. Schreiner, “Microfluidic Sensors Using LTCC Technology for Environmental Monitoring Applications”, 15th International Conference on Environmental Science and Technology, Rhodes, Greece, September 2017;
6. I. Mercioniu, A.M. Vlaicu, R. Negrea, C. Ghica, “Study Concerning Oxidation Processes of NiCoCrAlY Bond Layers for Thermal Barriers Coatings”, 9th International Conference on Nanomaterials – Research & Applications, Brno, Czech Rep., October 2017;
7. R.F. Negrea, C. Ghica, N. Kaur, R. Ciprian, C. Istrate, “Microstructural Characterisation of BNT-BT Ferroelectric Thin Film by Advanced TEM Techniques”, 9th International Conference on Nanomaterials – Research & Applications, Brno, Czech Rep., October 2017;

8. A. Kuncser, A. Stanciu, A. Catrina, G. Schinteie, V Kuncser, “Micromagnetic Analysis on Lamellar vs. Disperse Structures of Fe Nanoparticles in Au Thin Films”, 9th International Conference on Nanomaterials – Reasearch & Applications, Brno, Czech Rep, October 2017. In the Figure can be seen the LTCC structures with different dimensions, The model of designed structures and the special injection system with peristaltic pump, reservoirs and pressure injection.





PROJECT DETAILS

Call	Call 2013
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	Technical University Iasi, Romania (Coordinator) Institutul National Cercetare-Dezvoltare pentru Fizica Materialelor, Romania (Partner) Intelectro Iasi SRL, Romania (Partner) Jozef Stefan Institute (JSI), The Electronic Ceramics Department, Slovenia (Partner) HIPOT-RR raziskave in razvoj tehnologij in sistemov, d.o.o., Slovenia (Partner) DROPSENS, Asturias (Partner) Centre of Excelence NAMASTE, Slovenia (Partner)
Total project cost	€ 695,750
Contact	Technical University Iasi Str. Prof.dr.doc. Dimitrie Mangeron, nr. 67, Iasi, 700050, Romania Cristina Schreiner Phone: +40 232278683 E-mail: cschrein@tuiasi.ro

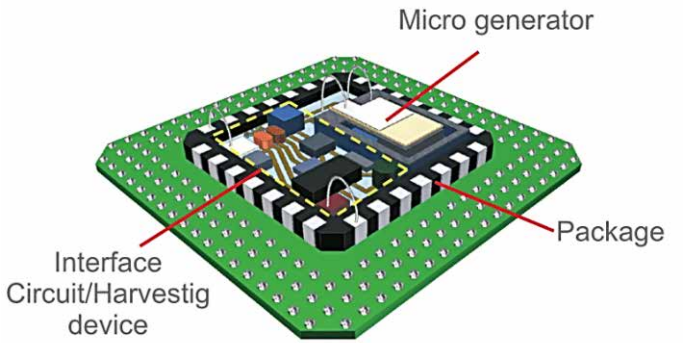
Project Consortium details via Link to ERA-LEARN

ENABLING TECHNOLOGIY FOR HIGH-QUALITY PIEZOMEMS – ENPIEZO

ENPIEZO was focused on developing piezoelectric-based energy-harvesting (EH) devices to provide a remote source of electricity for various applications by exploiting waste vibrations. The project brought together four partners with diverse expertise, enabling a comprehensive approach for developing the materials and designing a device.

Owing to its excellent piezoelectric properties, $Pb(Mg_{1/3}Nb_{2/3})O_3$–$PbTiO_3$ (PMN-PT) was selected as the functional layer for the device and grown as either a thin epitaxial layer on Si or as a thicker polycrystalline layer on stainless steel substrates. Mathematical modelling of EHs for epitaxial and polycrystalline layers was performed for the longitudinal and transverse modes of EH operation. A device design with the optimal layer thickness, electrode configuration and proof mass was developed using calculated and experimentally determined mechanical properties of the materials. Along with the buffer layers, necessary to integrate epitaxial PMN-PT with Si, the growth was first studied on a laboratory-scale pulsed-laser deposition (PLD) system, examining the crystal structure from an atomic to a macroscopic scale, along with the chemical composition of the films and the resulting functional properties. The growth was then transferred to an industrial scale PLD, where high-quality PMN-PT thin films were grown on large (8'') wafers. In parallel, thicker polycrystalline PMN-PT was grown on stainless steel using aerosol deposition. Test devices were constructed from the prepared samples and the experimental results were compared to the mathematical model. A power output of 90 μW was achieved at 0.5 g acceleration for 10 μm thick films with a quality factor of 147. The resonant frequency was 98 Hz. A device model was proposed, with the integration of all components of the EH, enabling its use various applications, such as in transformers, bearings rotary systems, encoders, etc.

The partners have published 7 ISI papers (three additional papers are in preparation) and presented their work at 28 international conferences. Additionally, two doctoral degrees and two masters degrees have been achieved as a result of the project. For more information, please visit the project's website:**enpiezo.ijs.si/**



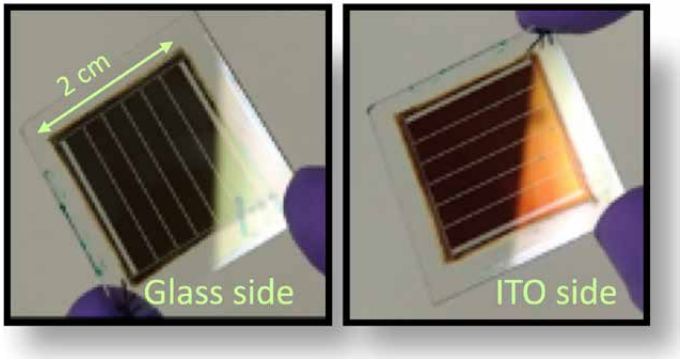
PROJECT DETAILS

Call	Call 2013
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	Jožef Stefan Institute, Slovenia (Coordinator) Stiftelsen SINTEF, Norway (Partner) National Taiwan University, Taiwan (Partner) COSYLAB, Control System Laboratory, d.d., Slovenia (Partner)
Total project cost	€ 1,199,645
Contact	Jožef Stefan Institute, Advanced Materials Department Jamova cesta 39, 1000 Ljubjana, Slovenia Asst. Prof. Matjaž Spreitzer E-mail: matjaz.spreitzer@ijs.si
Project website	enpiezo.ijs.si

Project Consortium details via Link to ERA-LEARN

TRANSPARENT PEROVSKITE SOLAR CELL – CLEARPV

The objective of the project is to develop large-area semi-transparent 6 inch durable perovskite photovoltaic modules with power conversion efficiency (PCE) over 13%. The modules can be directly used as building units. Moreover, they can be stacked with silicon solar cells for an expected PCE over 18% and approaching 25%. The project has a stable foundation in reliable co-operations established between the partners earlier, partly in the framework of a previous successful M-ERA.Net program. Co-operation in CLEARPV actively utilizes sample exchange, student exchange, and scientific visits. The PIs have jointly organized a very successful Perovskite Workshop as a satellite event of the international SIWAN 2018 conference. The project has just finished its second year, and has produced some impressive results already. It was demonstrated that the incorporation of potassium ion into the perovskite precursor and using dipolar ion post-treatment to perovskite film can efficiently reduce the open-circuit voltage loss and thus improve the large band-gap devices performance to 15.34%. Promising experiments are running to replace the semiconductor used as hole transporting layer, and an upscaling technology was demonstrated for manufacturing of semi-transparent perovskite solar cell and modules. Slot die coating process has been developed and implemented for cells and modules manufacturing. sALD has been developed and implemented for ETL-BL processing. The performance of the perovskite solar cells produced on 6 inch x 6 inch substrates using newly developed processes was higher than the performance of the reference devices produced on 3 cm $\times$ 3 cm substrates by spin coating The CLEARPV consortium has published 8 peer-reviewed papers in the first two years of the project in high visibility journals including ACS Applied Energy Materials, ACS Omega, Advanced Functional Materials and Nano Energy. In addition, 19 conference publications were presented and 2 patent applications filed.



PROJECT DETAILS

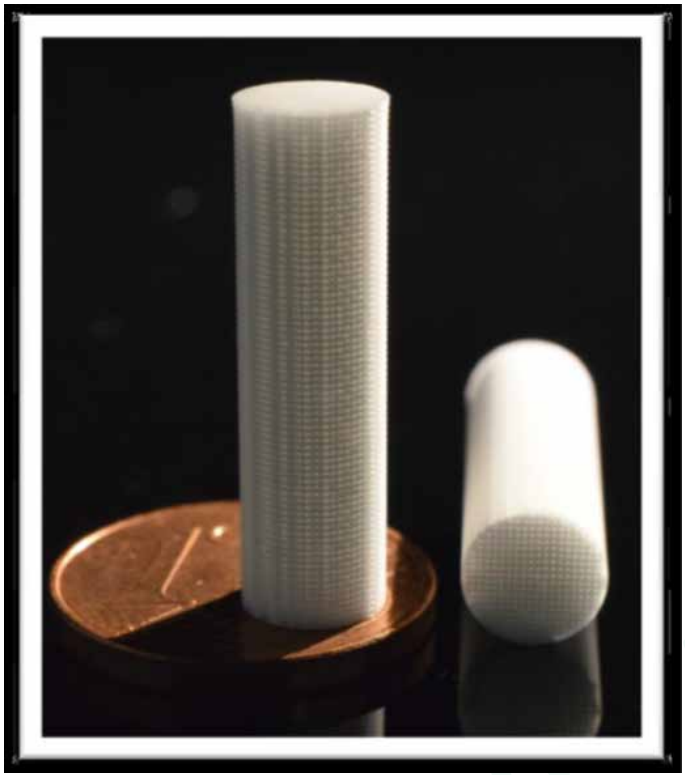
Call	Call 2016
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	National Taiwan University, Taiwan (Coordinator) Holst Centre (TNO), Netherlands (Partner) University of Szeged, Hungary (Partner) Frontmaterials Co. Ltd., Taiwan (Partner)
Total project cost	€ 620,000
Contact	Department of Materials Science and Engineering, National Taiwan University 1, Roosevelt Road Sec. 4, CEDEX 106, Taipei, Taiwan Prof. Wei-Fang Su E-mail: suwf@ntu.edu.tw
Project website	www.clearpv.org

Project Consortium details via Link to ERA-LEARN

NEW STRUCTURED SUBSTRATES FOR DOWNSTREAM PROCESSING OF COMPLEX BIOPHARMACEUTICALS – NESSIE

The recent pandemic caused by the COVID-19 virus shows the world the importance and the great need of vaccines that can effectively combat such diseases. However, the development of an effective vaccine involves a lot of effort and the highest safety standards. Production is therefore often slow and very expensive.

The project NESSIE addresses precisely these weaknesses. NESSIE was initiated by SINTEF, a Norwegian research organization, Lithoz, world market leader in 3D printing of ceramics, and IBET, a Portuguese biopharmaceutical research centre. genIbet and Cerpotech joined the consortium bringing their expertise on manufacturing of biopharmaceuticals and innovative materials, respectively. The project aims to increase the efficiency with which vaccines are produced and is already contributing to the development of novel methods to purify viruses, such as adenovirus-5. Adenoviruses are excellent vectors for delivering genes or vaccine antigens to humans. Many of the successful vaccines actually use viruses to deliver the necessary elements to get immune. Such viruses are expensive to produce. Furthermore like many substances used for humans, there is extra caution with the purity and purification of these viruses is very expensive. Using ultra-high resolution ceramic 3D printing and applying a novel design for the manufacture of chromatographic columns (the most advanced purification technology), the project will improve separation and reduce production costs. NESSIE succeeded in the production of the first chromatographic supports (see picture below) and will soon test them for adenovirus purification. The Nessie research project shows that revolutionary technologies such as 3D printing can improve our healthcare system in a sustainable way. Already today we see the strengths of this digital technology. With the current closure and shortage of medical supplies, 3D printing has proven that local manufacturing can be more than just making prototypes. 3D printing is helping to quickly reproduce component regardless of location and without being dependent from complex supply chains in a cost-effective way.



High-resolution ceramic 3D printed support retrofittable to existing chromatographic columns

PROJECT DETAILS

Call	Call 2016
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	36 months
Partners	SINTEF, Norway (Coordinator) IBET, Portugal (Partner) Lithoz, Austria (Partner) Genlbet, Portugal (Partner) Cerpotech, Norway (Partner)
Total project cost	€ 792,866
Contact	SINTEF Forskningsveien 1, Oslo 0373, Norway Dr. Carlos A. Grande Phone: +47 93207532 E-mail: Carlos.grande@sintef.no
Project website	www.sintef.no/projectweb/nessie

Project Consortium details via Link to ERA-LEARN

HIGH PERFORMANCE NANOSTRUCTURED COATINGS USING IONIC LIQUIDS BASED ON CHOLINE CHLORIDE – NANOCOATIL

NANOCOATIL aimed to develop novel strategies to produce different nanostructured coatings involving choline chloride based ionic liquids (also known as Deep Eutectic Solvents – DESs), possessing better corrosion performance and enhanced growth rate. NANOCOATIL addressed new processing routes and new solutions to develop nanostructured coatings with tailored properties through optimization either cathodic or anodic reaction.

Within the project NANOCOATIL, corrosion resistant Ni-Mo (5–45 wt.% Mo) and Co-Mo (5–65 wt.% Mo) alloys have been produced by electrodeposition involving novel choline chloride – urea – citric acid ternary mixtures, as well as Co-multiwalled carbon nanotubes (Co-MWCNT) composites. Moreover, anodic oxides as nanopowders or ordered nanoporous layers with an enhanced growth rate have been successfully developed onto valve metals (i. e. Al, Ti) using new DES formulations.

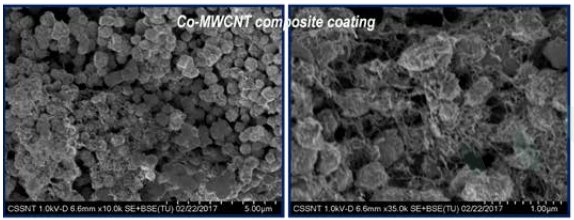
During the project, several goals could be achieved:

- Development of various ionic liquid eutectic mixtures formulations suitable for applications in metals and alloys electrodeposition and anodic oxidation of valve metals;
- Successful development of novel electrochemical procedures to deposit nanostructured Ni-Mo and Co-Mo alloy coatings with enhanced corrosion performance. Corrosion current densities in the range of few up to tens of microampers per square centimeter were determined after long-term immersion in 0.5M NaCl aggresive environment;
- Successful development of novel electrochemical procedures to deposit Co-MWCNT composite coatings with enhanced corrosion performance. The superior corrosion characteristics of the Co-MWCNT composite may be associated with the presence of the MWCNTs that may hinder the diffusion of aggressive Cl-ions;
- Successful development of novel Al anodization routes involving chloride free DES based electrolytes, allowing the growth of ordered nanoporous structures having pore diameters between 50–80 nm and interpore distances in the range of 160–200 nm, at anodization rates of about 0.2–0.4 μm/min. and anodic efficiencies between 65–87%;
- Design and construction of a small scale laboratory prototype to validate the elaborated technologies.

The full publication list can be found under cssnt-upb.ro/

pro/nanocoatil/diseminari_nanocoatil/. We would like to emphasize the paper:

Investigation of Ni-Mo and Co-Mo alloys electrodeposition involving choline chloride based ionic liquids, Stefania Costovici , Adrian Manea, Teodor Visan, Liana Anicai, Electrochimica Acta, 207 (2016) 97–111.



PROJECT DETAILS

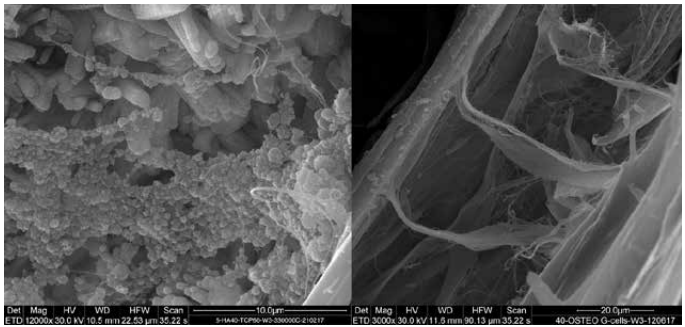
Call	Call 2012
Call Topic	Innovative Surfaces, Coatings and Interfaces
Duration	24 months
Partners	University POLITEHNICA of Bucharest, Center for Surface Science and Nanotechnology (UPB-CSSNT), Romania (Partner) University of Porto, The Faculty of Sciences, (FCUP), Portugal (Partner) DUNE NANOMAT CENTER SRL Pitesti(DUNE), Romania, (Partner)
Total project cost	€ 421,424
Contact	University POLITEHNICA of Bucharest, Center for Surface Science and Nanotechnology Splaiul Independentei 313, sector 6, 060042, Bucharest, ROMANIA Dr. Liana Anicai, 1st level senior scientist Phone: +40 214029100 E-mail: lanicai@itcnet.ro; liana.anicai@cssnt-upb.ro
Project website	cssnt-upb.ro/pro/nanocoatil

Project Consortium details via Link to ERA-LEARN

FEASABILITY STUDY: DEVELOPMENT OF 3-D PATIENT-TAILORED BONE TISSUE ENGINEERED PRODUCTS COMBINING OSTEOBLASTS AND SCAFFOLD FOR THE REPAIR OF MASSIVE BONE DEFECTS – CERACELL

The aim of CERACELL was to assess the feasibility of developing customized bone engineered products combining osteoblasts on 3D patient-tailored bioresorbable microporous bioceramic scaffolds for the reconstruction of bone defects. This high tech tissue engineered product was expected to produce an enhanced environment for the bone regeneration, and the shape of the scaffold was designed to replace the missing bone part as accurately as possible. To achieve this goal, CT-scan images of the bone defects were analyzed by Image Analysis using 3D reconstruction algorithms. A contour approach based upon an atlas shape of normal bone were used to accurately determine the set of image voxels that constitutes the missing volume of bone, giving a 3D bit map of the shape to be printed which were converted to the required formats for the printer. As cells are affected by the physicochemical & structural properties of scaffolds, different combinations of the osteoblasts with different bioceramic scaffolds were tested. SIRRIS was in charge of printing the 3D non-determined shape scaffold pieces not only with different bioceramic contents but also with different porosities using an additive manufacturing process: according to the 3D shape bit map, a UV laser will polymerize photocurable resin filled with the ceramic (layer by layer deposition, then debinding and sintering). Cell adhesion, survival, proliferation & colonization were determined by Bone Therapeutics on printed scaffolds, and their biomechanical properties were tested before and after cell colonization. Based on the results, the selected bioceramic scaffolds (ratios, porosity…) were used by SIRRIS to create the tailored 3D pieces with the programming algorithms generated by Image Analysis. Then, cell colonization and characterization studies were performed in vitro by Bone Therapeutics.

In summary, CERACELL validated the feasibility of manufacturing 3D patient-tailored bone tissue engineered products and studied their bone repair and biocompatibility properties. Bone Therapeutics has expanded its portfolio of bone products, Image Analysis has developed novel techniques for modelling voids in predicted shapes, and SIRRIS has continued to extend its knowledge in ceramic material and in additive manufacturing process for new purposes in bone engineering.



LEFT: Deposition of mineralized globular accretion on matrix observed at week 3; RIGHT: Collagen fibers production of cells within cavities oft he scaffold.

PROJECT DETAILS

Call	Call 2013
Call Topic	Materials for Health Applications
Duration	24 months
Partners	Bone Therapeutics, Belgium (Coordinator) Sirris (Cerhum), Belgium (Partner) Image Analysis, United Kingdom (Partner)
Funded by	Belgium Wallonia United Kingdom
Total project cost	€ 800,108
Contact	Bone Therapeutics 37, rue Auguste Piccard 6041 Gosselies, Belgium Emilie Ansciaux Phone: +32 71121148 E-mail: Emilie.ansciaux@bonetherapeutics.com

Project Consortium details via Link to ERA-LEARN

NEW CONSTRUCTION MATERIALS AND PRODUCT DESIGN FOR ADDITIVE MANUFACTURING PROCESSES IN THE CONSTRUCTION INDUSTRY – BAUPROADDI

Digital fabrication is an emerging new technology in the construction industry as it decreases the need of human labour on construction sites and increases the freedom of architectural design as well as productivity. In BauProAddi the development of 3D printable materials and the development of additive manufacturing processes was targeted by a variety of industrial and academic partners in order to depict wide parts of the potential supply and value chains of 3D printing in construction. The production of cement and cement additives, hard- and software development of 3D concrete printers as well as the inclusion of 3D printing in the recent building processes and that of the future were topics addressed within the project. In the frame of BauProAddi several 3D printing devices were successfully developed, and various 3D printing materials were optimized on them. Further a volumetric flow-controlled extruder for 3D concrete printing was developed and successfully tested resulting in various demonstrators. Three dimensional objects with complex geometries were printed and software tools for the automatic generation of printing paths were programmed. For industrial use, 3D printable materials with comparatively simple compositions were developed, and suitable characterization methods were adopted. Another major objective of the research project was the development of cements and binders with optimised environmental footprints that can be used in printable mortars and concretes. These binders are to be used to implement high-quality, fast, feasible and cost-effective, additive production processes in the construction industry. With this work, BauProAddi supports the important aspect of innovative as well as sustainable material development to enable the additive production process. Several publications rendered from this work and were published in international conferences and scientific journals.

PROJECT DETAILS

Call	Call 2016
Call Topic	Materials for Additive Manufacturing
Duration	39 months
Partners	TU Berlin, Germany Fraunhofer IPK, Germany (Partner) SIKA Germany GmBH, Germany (Partner) OPTERRA Zement GmbH, Germany (Partner) Kadia Production GmbH + Co, Germany (Partner) Ed. Züblin AG, Germany (Partner) Doka GmbH, Germany (Partner)
Contact	TU Berlin Gustav-Meyer-Allee 25, 13355 Berlin Prof. Dr. Dietmar Stephan Phone: +49 30 31472101 E-mail: info@baustoffe.tu-berlin.de
Project website	www.bauproaddi.eu

Project Consortium details via Link to ERA-LEARN

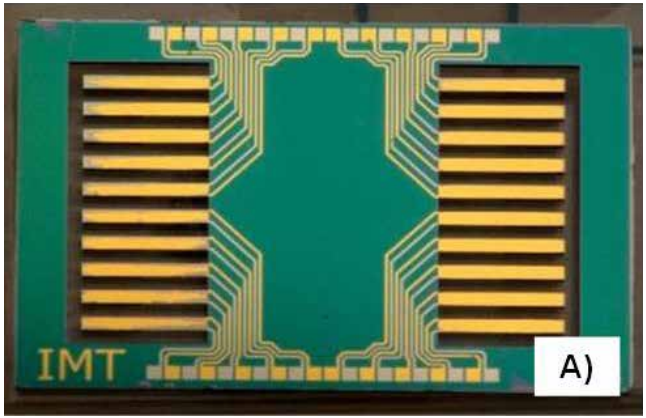
PIEZOELECTRIC MEMS FOR EFFICIENT ENERGY HARVESTING – PIEZOMEMS

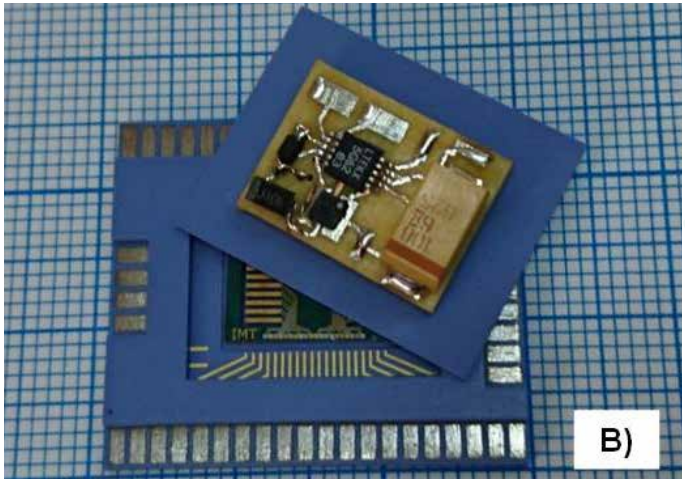
The trend of reduction in size and power consumption of sensors and associated metal oxide semiconductor circuitry has led us to a focused research about on-board power sources that can replace batteries. As a result, the most important thing in such cases has been developing on-site generators that can transform any available form of energy at that location into electrical energy. The project developed a new piezoelectric harvester based on micro-electro-mechanical system (MEMS) devices and piezoelectric materials together with storage module and power circuitry. It focuses on small-scale power energy harvesting techniques (1–100μW) for autonomous operation of portable or embedded micro devices and systems. The harvester includes a MEMS device based on 20 micrometric cantilevers, covered with a piezoelectric lead-free thin film (ZnO, KNN and AlN have been tested), connected together for increasing the power density and is dedicated to powering portable biomedical devices or sensors networks.

The complete device is shown in the Figure: the piezoelectric MEMS harvester (Figure A) and the ceramic package with the electronic modules for stabilisation and storage (Figure B).

The PiezoMEMS prototype, miniaturised and lightweight – 2.5 x 3 x 1 cm and 16 grams, provided 1.8V (stabilised voltage) output, which is sufficient to power up a wide range of commercially available microcontrollers or to intermittently collect data from sensors nodes. The generated energy can also provide sufficient power for the new generations of ultra-small power integrated circuits, which are optimised to only need tens of nW to hundreds of uW of power.

The results were presented within the International Workshop “Microsystems for Energy Harvesting and Environment Monitoring”, Oct. 2018, Sinaia, Romania. For more information please visit the project’s website, **http://www.imt.ro/piezomems/.**



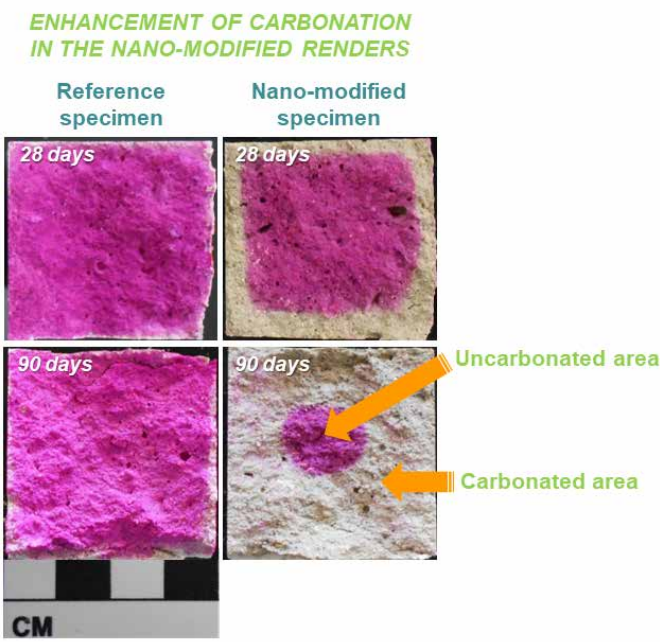


PROJECT DETAILS

Call	Call 2013
Call Topic	Materials for Sustainable and Affordable Low Carbon Energy Technologies
Duration	36 months
Partners	National Institute for Research and Development in Microtechnologies, Romania (Coordinator) "Ilie Murgulescu" Institute of Physical Chemistry, Romania (Partner) Jožef Stefan Institute, Slovenia (Partner) HIPOT-RR, Slovenia (Partner) Institute of Electron Technology, Poland (Partner) ROMELGEN SRL, Romania (Partner) MEDBRYT, Poland (Partner)
Funded by	Romania, Slovenia, Poland (NCBR)
Total project cost	€ 642,500
Contact	National Institute for Research and Development in Microtechnologies, 126A Erou Iancu Nicolae, 077190, Voluntari, Ilfov, Romania Dr. Carmen Moldovan E-mail: carmen.moldovan@imt.ro Phone: +40 212690770
Project website	www.imt.ro/piezomems

Project Consortium details via Link to ERA-LEARN

ENERGY EFFICIENT NANO-MODIFIED RENDERS WITH CO_2-STORAGE POTENTIAL – CCSRENDER



Anthropogenic activities over the past century have caused a dramatic increase of carbon dioxide (CO_2) concentration in the atmosphere. A potential solution to this crucial problem is the storage of CO_2 through mineral carbonation, which comprises one of the most promising carbon capture and storage (CCS) technologies. The aim of the CCSRender project was the development of novel, environmentally-friendly lime-based renders with the ability to sequester CO_2 directly from the atmosphere via in situ mineral carbonation. This was achieved through the addition of suitable mafic/ultramafic rocks (including quarry waste materials) in nanoscale to the aforementioned composite building materials.

The first stages of the CCSRender project included sampling of mafic/ultramafic rocks and quarry fines from Cyprus and Hungary. Based on their mineralogical composition, the most promising samples were subjected to the ball milling process in order to create nano-sized rock powders with enhanced CO_2 sequestration capacity. The goal was to mimic and

accelerate the natural process of mineral carbonation by reducing the particle size of specific rock samples down to the nanoscale range. During this 2-year project, a significant number of ball milling experiments were performed, aiming to determine the optimum milling parameters for each individual rock sample. The research team focused on the development of sufficient quantities of the most promising nano-sized powders in order to be used as additives during the preparation of render mix designs. A significant number of nano-modified render mixtures were prepared by adding the new nanomaterials at different quantities (in partial replacement to the lime binder).

The end-products were characterized through a wide range of analytical methods and laboratory tests. The results revealed that the nano-modified renders showed a significantly denser microstructure compared to the reference specimens, due to the nano-filler effect, in combination with the enhancement of the carbonation reactions. This clearly indicated that the use of the aforementioned nano-additives in renders can (i) notably accelerate the carbonation reactions at ambient conditions, thus enhancing the early-age physico-mechanical properties of the end-products, and (ii) contribute to the mitigation of atmospheric CO_2 concentrations.

The positive results of the CCSRender project were further supported by pilot applications, which confirmed the enhanced performance of the new nano-modified building materials under real exposure conditions. The advantage of the aforementioned methodology, besides enhancing the carbonation reaction and physico-mechanical properties of the composite material, is that it could also contribute to the reduction of the CO_2 emissions associated with the production of lime, due to the partial replacement of the latter by the new nano-additives.The approach proposed in the framework of the CCSRender project becomes significant since the COP21 Paris Agreement aims to avoid future dangerous climate changes by limiting global warming to well below 2°C above the pre-industrial levels. Accordingly, the development of environmentally-friendly building materials through the sustainable exploitation of quarry waste materials worldwide, could notably contribute to the strategies for the mitigation of global greenhouse gas emissions.

The project results have been presented to the scientific community through 4 publications in peer-reviewed international scientific journals and 7 peer-reviewed articles/abstracts in international conferences (**http://ccsrender.org**/).

We would like to emphasize this review paper:

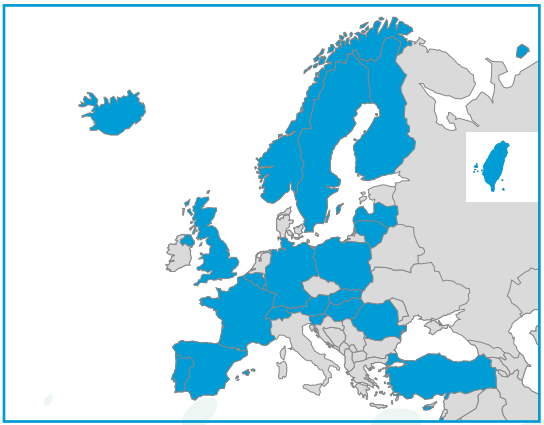
RIGOPOULOS, I., IOANNOU, I., DELIMITIS, A., EFSTATHIOU, A.M., KYRATSI, TH., 2018. Ball milling effect on the CO_2 uptake of mafic and ultramafic rocks: a review. Geosciences (Special Issue "Carbon Sequestration"), 8 (11), 406 [invited],doi.org/10.3390/geosciences8110406

PROJECT DETAILS

Call	Call 2016
Call Topic	Materials for Sustainable and Affordable Low Carbon Energy Technologies
Duration	28 months
Partners	University of Cyprus, Cyprus (Coordinator) Tsircon Co. Ltd., Cyprus (Partner) Budapest University of Technology and Economics, Hungary (Partner)
Total project cost	€ 319,960
Contact	University of Cyprus, Budapest University of Technology and Economics 75 Kallipoleos, 1678 Nicosia, Cyprus Dr. Ioannis Ioannou E-mail: ioannis@ucy.ac.cy Phone: +357 22892257
Project website	ccsrender.org

Project Consortium details via Link to ERA-LEARN

INFORMATION ABOUT THE CALLS:

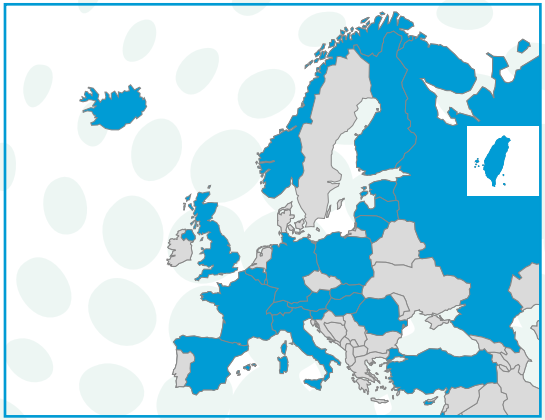


Call 2012:

30 funding organisations participated

124 pre-proposals were submitted
72 full proposals were submitted
23 projects were funded

Results are available here:
www.m-era.net/joint-call-2012/results



Call 2013:

32 funding organisations participated

166 pre-proposals were submitted
90 full proposals were submitted
26 projects were funded

Results are available here:
www.m-era.net/joint-call-2013/results

Call 2014:

36 funding organisations participated

173 pre-proposals were submitted
105 full proposals were submitted
22 projects were funded

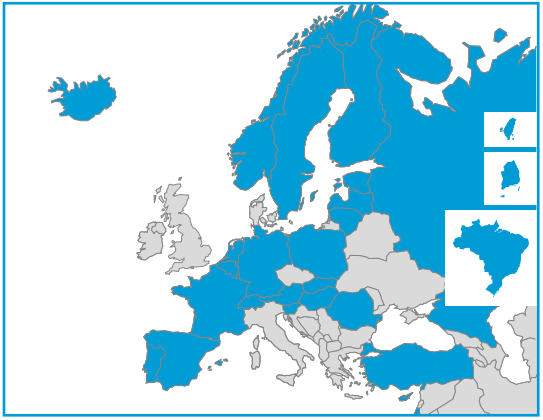
Results are available here:
www.m-era.net/joint-call-2014/results

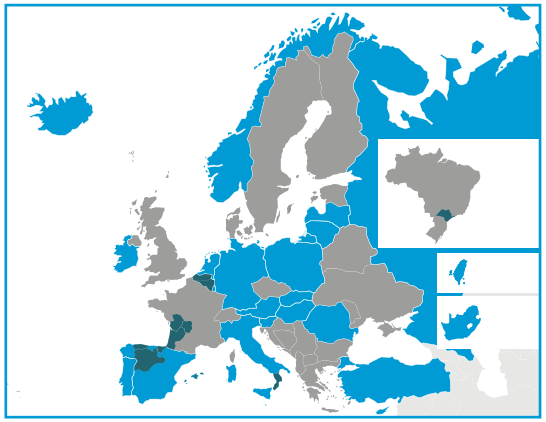
Call 2015:

35 funding organisations participated

156 pre-proposals were submitted
93 full proposals were submitted
22 projects were funded

Results are available here:
https://m-era.net/joint-call-2015/results-of-m-era-net-call-2015





Call 2016:

35 funding organisations participated

233 pre-proposals were submitted
89 full proposals were submitted
46 projects were funded

Results are available here:
https://m-era.net/joint-calls/joint-call-2016/results-of-m-era-net-call-2016

EDITORIAL REMARKS

The success stories of projects funded within the M-ERA.NET Joint Transnational are presented on the M-ERA.NET website **www.m-era.net/success-stories.**

Each success story has been written by the project consortium. For editorial purposes, some of them have been condensed here.

A first booklet containing 14 success stories has been published 2018.
The success stories booklet 1 and 2 are available in a printed and an electronic version.
The pdf-files are available on the M-ERA.NET website referring to the publications: **www.m-era.net/links**
The collection is ongoing.

IMPRINT

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p. 32: CCSRender

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