

# ADVANCED MATERIALS AND PERSPECTIVE TECHNOLOGIES OF THEIR PRODUCTION AND TREATMENT IN HORIZON EUROPE FRAMEWORK PROGRAM

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# SCOPE

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# MATERIAL SCIENCE BACKGROUND



- ▶ **Alliance for Materials (A4M)** - a joint initiative of technology platforms, academia, research institutes, and industry, working in the field of MATERIALS. (under the initiative of EUMAT technology platform)
- ▶ **Alliance for Materials (A4M)** - the **largest materials R&D&I community of Europe**, promoting the **leading global position and competitiveness** of the European technology in the area of **Advanced Engineering Materials**.
- ▶ Two main documents with short-term and long-term goals, tasks – so called materials science vision:

## **A4M memorandum**

([https://www.eumat.eu/media/uploads/descargas/19\\_11\\_12\\_alliance\\_for\\_materials\\_memorandum.pdf](https://www.eumat.eu/media/uploads/descargas/19_11_12_alliance_for_materials_memorandum.pdf))






**A4M opinion paper** (<https://www.european-mrs.com/latest-news/a4m-opinion-paper-governance-and-strategic-programming-materials-research-and-innovation>)

The main attention to the following questions:

- ▶ how **materials** can contribute to reduction of CO2 emissions to make Europe **the first Climate Neutral Continent**
- ▶ how can materials help to reach **zero pollution** in air, water, oceans, and industrial emissions, while preserving competitiveness and biodiversity
- ▶ how can materials contribute to the **digital age, protecting the European well-being** and health, while building a stronger Europe, ready to serve the needs of our citizens

# MATERIAL SCIENCE BACKGROUND

- **Problem solving, impact and system-oriented Materials research approach. For example:** materials Challenges addressing Sustainable Development Goals (SDG)

SDG	The Problem	The material's solution	The Key Enabling technologies	The Impact
	About <b>29% of the energy consumption</b> is for transport. <sup>3a</sup>	Light alloys: Al, Mg, high strength steels, plastics, composites, polymer formulations	Higher strength/ weight, coatings, nanotechnology 3D printing	The value of weight reduction is 870€/kg in aeronautic <sup>3b</sup>
	20 % of <b>all energy produced</b> worldwide (119EJ, exa-joules) <b>goes to overcome friction</b> <sup>4, 13</sup>	Advanced coatings, texturing, low viscous fluids, 2D additives, ionic liquids, bioinspired H-free DLC, nanoparticles	Tribology (accelerated test at product design phase) Infrastructure for testing on line components lifetime	Potential savings with new material solutions: transport (25%), industries & power generation (15%), residential (10%). <sup>4</sup>
	The economic losses worldwide due to wear is €684,72Billion <sup>4, 13</sup>	Nanotechnology, 3D printing, additive manufacturing, texturing, advanced coatings, lubricants	Tribology study of durability at design phase (a system approach) Modelling, artificial intelligence, Multiscale	Attention to tribological problems would imply worldwide annual savings of €970 Billion € (1.39 % GDP). <sup>4</sup>
	Global <b>cost of corrosion is 3-4% GDP</b> (Gross Domestic Product). <sup>5a</sup> How to reduce it?	Advanced coatings, nanotechnology, self healing coatings, protection, control hydrogen embrittlement	Accelerated corrosion tests advanced materials, modelling	Potential to reduce the cost by €761 billion annually with advanced materials technologies <sup>5b</sup>
	The <b>thermal energy</b> losses can represent 50% of fuel consumption <sup>6</sup>	Thermoelectric, phase change material, nanomaterials	Energy efficiency Co-generation Heat exchangers	Energy Recovery amounting to 20% in manufacturing sector <sup>6</sup>

# UKRAINE IN HORIZON 2020



- ❑ УГОДА між Україною і Європейським Союзом про участь України у програмі Європейського Союзу Горизонт 2020 - Рамкова програма з досліджень та інновацій (2014-2020). Угоду ратифіковано Законом № 604-VIII від 15.07.2015 ([https://zakon.rada.gov.ua/laws/show/984\\_018#n2](https://zakon.rada.gov.ua/laws/show/984_018#n2))
- ❑ In Horizon 2020 *Ukraine - associated country* (Albania, Armenia, Bosnia and Herzegovina, Fagoe Islands, Georgia, Iceland, Israel, North Macedonia, Moldova, Montenegro, Norway, Serbia, Switzerland, Tunisia, Turkey, Ukraine).
- ✓ Key figures for Ukraine (<https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8-acec-e77640154726/sheet/0c8af38b-b73c-4da2-ba41-73ea34ab7ac4/state/0>)
- ✓ Net EU Contribution - 45, 75 millions Euro (0,76 % from AC budget)
- ✓ Signed grants - 228 (2,90 % from AC total), including 50 - materials science and 25 -CSA and others, connected with material science
- ✓ Participations - 318 (2,38 % from AC total) - 127 MSCA
- ✓ Success rate - 9,22 (13,35 % from AC average)
- ✓ Eligible proposals 2201 (3,95 % from AC total)
- ✓ Number of organizations/applications 2838 (3,42 % from AC total)

# UKRAINE IN HORIZON EUROPE



- ✓ Application form from Ministry of Education of Science of Ukraine had been submitted
- ✓ Several rounds of technical consultation had been arranged
- ✓ Agreement is under preparation, next step signing and ratification, it need time
- ✓ For all open calls in 2021 participation of Ukrainian organizations are eligible as for associated country
- ✓ The same will be eligible for the first calls of 2022 ( deadlines in January and February of 2022)

## Horizon 2020 follow up:

- ❑ Уряд ухвалив зміни до Положення про конкурсний відбір наукових, науково-технічних робіт та проєктів, які фінансуються за рахунок зовнішнього інструменту допомоги Європейського Союзу для виконання зобов'язань України в Рамковій програмі Європейського Союзу з наукових досліджень та інновацій «Горизонт 2020».
- ❑ Рішення ухвалено 28 квітня 2021 року, постановою Кабінету Міністрів України в частині розширення напрямів спрямування коштів спеціального фонду, отриманих за рахунок відповідного зовнішнього інструменту допомоги Європейського Союзу.  
(<https://mon.gov.ua/ua/news/zmineno-poryadok-konkursu-naukovih-robit-ta-innovacijnih-proyektiv-yaki-finansuyutsya-v-mezhah-dopomogi-yes-ukrayini-u-programi-gorizont-2020-rishennya-uryadu>)
- ❑ *Dates of MES calls – October 2021 ( see the web-site of MES of Ukraine)*

# HORIZON EUROPE STRUCTURE

Horizon  
Europe





# CLUSTER 4: DIGITAL, INDUSTRY, SPACE

## ➤ DESTINATION 1 - CLIMATE NEUTRAL, CIRCULAR AND DIGITISED PRODUCTION

(green, flexible and advanced manufacturing, advanced digital technologies for manufacturing, - made in Europe partnership; new way to build, accelerating disruptive change in construction - Built4People partnership, hubs for circularity, a steppingstone towards climate neutrality and circularity in industry, enabling circularity of resources in the process industries, including waste and CO<sub>2</sub>/CO - processes4Planet partnership)

## ➤ DESTINATION 2 - INCREASED AUTONOMY IN KEY STRATEGIC VALUE CHAINS FOR RESILIENT INDUSTRY

(novel paradigms to establish resilient and circular value chains - Processes4Planet Partnership, raw materials for EU open strategic autonomy and successful transition to a climate-neutral and circular economy, green and sustainable materials, materials for the benefit of society and the environment and materials for climate-neutral industry, materials and data cross-cutting actions, improving the resilience and preparedness of EU businesses, especially SMEs and Startups,

## ➤ DESTINATION 3 - WORLD LEADING DATA AND COMPUTING TECHNOLOGIES (Data sharing in the common European data spaces , Strengthening Europe's data analytics capacity and etc.)

## ➤ *special attention to KSO - key strategic orientations from Horizon Europe Strategic Plan*

[https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-4-digital-industry-and-space\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-4-digital-industry-and-space_en)



# CLUSTER 4: DIGITAL, INDUSTRY, SPACE

- ▶ **DESTINATION 4 - DIGITAL AND EMERGING TECHNOLOGIES FOR COMPETITIVENESS AND FIT FOR THE GREEN DEAL**

(ultra-low power processors, European Innovation Leadership in Electronics , European Innovation Leadership in Photonics -Photonics Partnership, 6G and foundational connectivity technologies, Innovation in AI, Data and Robotics, European leadership in Emerging Enabling Technologies, Flagship on Quantum Technologies: a Paradigm Shift, 2- D materials)

- ▶ **DESTINATION 5 - OPEN STRATEGIC AUTONOMY IN DEVELOPING, DEPLOYING AND USING GLOBAL SPACE-BASED INFRASTRUCTURES, SERVICES, APPLICATIONS AND DATA**

(Foster competitiveness of space systems , Reinforce EU capacity to access and use space and etc.)

- ▶ **DESTINATION 6 - A HUMAN-CENTRED AND ETHICAL DEVELOPMENT OF DIGITAL AND INDUSTRIAL TECHNOLOGIES**

(Leadership in AI based on trust, Intellectual properties, etc.)

- *special attention to KSO - key strategic orientations from Horizon Europe Strategic Plan*

[https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-4-digital-industry-and-space\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-4-digital-industry-and-space_en)

# HORIZON-CL4-2022-RESILIENCE-01-12:

## Functional multi-material components and structures (RIA)



<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of between EUR 4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 19.00 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to start at TRL 3 and achieve TRL 6 by the end of the project – see General Annex B.

**Scope:** By combining several materials, proposals should advance the state of the art through the development of ready assembled multifunctional devices. The role of new development in additive manufacturing processes with dissimilar materials will be of importance

**Expected Outcome:** Optimised lightweight designs often require the use of multi-materials, often with different physical properties, such as **polymers composites and metals**. The manufacturing of multimaterial structures is thus a challenging task It is of great importance that multimaterial design is analysed from a holistic and multidisciplinary perspective where all aspects from design to manufacturing, use and recycling are included in the process.

# HORIZON-CL4-2022-DIGITAL-EMERGING-01-17: New generation of advanced electronic and photonic 2D materials-based devices, systems and sensors (RIA)



<i>Expected EU contribution per project</i>	The EU estimates that an EU contribution of up to EUR 16.40 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
<i>Indicative budget</i>	The total indicative budget for the topic is EUR 16.40 million.
<i>Type of Action</i>	Research and Innovation Actions
<i>Technology Readiness Level</i>	Activities are expected to start at TRL 3-4 and achieve TRL 5 by the end of the project – see General Annex B.

**Expected Outcome:**  
New technological solutions with improved performance and reduced energy consumption providing significant advances towards the integration of 2D materials (2DM) technology, and the emergence of competitive value chains in graphene in Europe.

**Scope:** Proposals should cover the development of 2DM-based devices and systems bringing 2DM technology one step further towards the integration in current technologies and to the development of radically new prototypes and/or solutions for industry overcoming integration costs, functionalities and/or power consumption challenges. The proposals should develop *2DM-based electronic and photonic devices* including ultrafast circuits, *photodetector, and modulators, broadband detectors, switches, as well as sensors, advanced electronics, metamaterials, etc.*

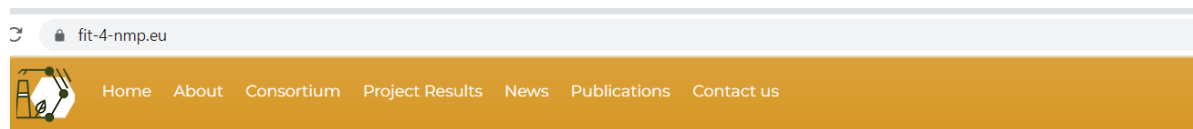
Proposals should aim at demonstrating by the end of the project fully functional prototypes operating in relevant environment conditions (TRL 5).

# CURRENT PROJECT. DEVELOPMENT OF NOVEL AND COST-EFFECTIVE COATINGS FOR HIGH-ENERGY PROCESSING APPLICATIONS (FORGE)



- ▶ Grant agreement ID: 958457
- ▶ Start date 1 November 2020
- ▶ End date 30 April 2024
- ▶ Overall budget € 5 982 612,50
- ▶ Coordinated by MBN NANOMATERIALIA SPA (Italy) (13 participants)
- ▶ Topic [LC-SPIRE-08-2020 - Novel high performance materials and components \(RIA\)](#)
- ▶ Call for proposal H2020-NMBP-ST-IND-2020-singlestage
- ▶ The EU-funded FORGE project will develop novel coatings of compositionally complex alloys and ceramics, combining machine learning models, thermodynamic calculations, and high-throughput experiments. FORGE will demonstrate these coatings on processes such as CO<sub>2</sub>-capture, waste heat recovery, components undergoing wear and in kilns, defying the acting degradation forces, and assuring coating effectiveness with smart monitoring of their deterioration. FORGE aims to minimise the overall capital and operative expenses especially in steelmaking, aluminium, tiles and cement industries.  
<https://cordis.europa.eu/project/id/958457>

# COMMUNICATION WITH CURRENT PROJECTS: FIT-4-NMP



Strategic and targeted support to incentivise talented newcomers to NMP projects under Horizon Europe

Grant agreement ID: 958255  
Start date 1 January 2021  
End date 31 December 2023  
Overall budget € 1 500 000  
Coordinated by INTELLIGENTSIA  
CONSULTANTS SARL  
(Luxembourg)  
10 partners  
NASU from Ukraine  
<https://www.fit-4-nmp.eu/>

Organize innovation workshops between talented newcomers and NMP Top Innovators;

- Provide hands-on support to talented newcomers to prepare NMP proposals for Horizon Europe;
- Facilitate networking for talented newcomers at major European conferences and regional brokerage events;
- Provide training to talented newcomers on technology-transfer, proposal writing, and use of European networking portals.

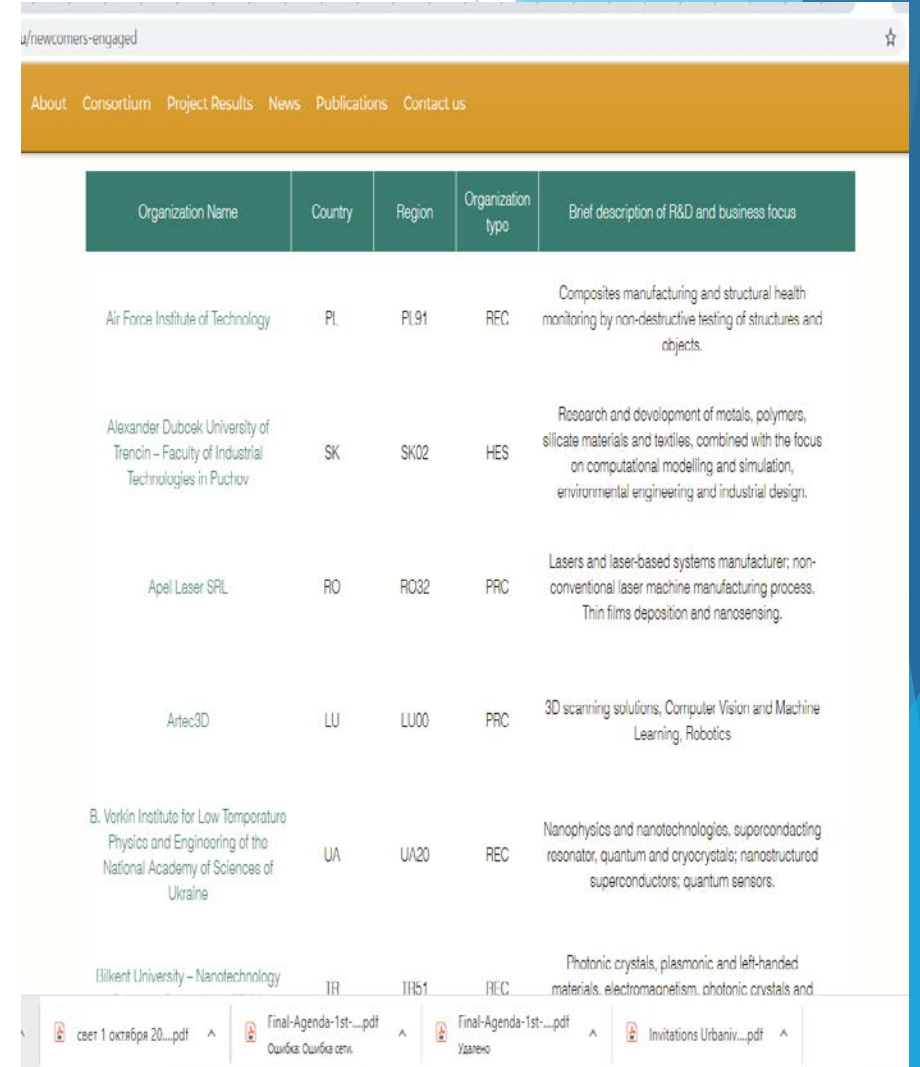
FIT-4-NMP will be undertaken by a strong consortium with partners located among many of the EU member states with the lowest participation in H2020 NMBP. Also, these partners represent “umbrella” organizations with extensive networks to innovative NMP organizations and talented newcomers in their regions.

# COMMUNICATION WITH CURRENT PROJECTS: FIT-4-NMP

## SUBMISSION OF IDENTIFICATION FORM:

- general information about an organisation;
- main activities **relevant to NMP**;
- R&D achievements & interests **relevant to NMP**;
- European & International level **NMP-relevant R&D projects** and proposals (other than H2020 NMP);
- national & regional level **NMP-relevant R&D projects** and proposals;
- choose NMP domain from proposed list;
- contacts

***One form for one organization!***



u/newcomers-engaged

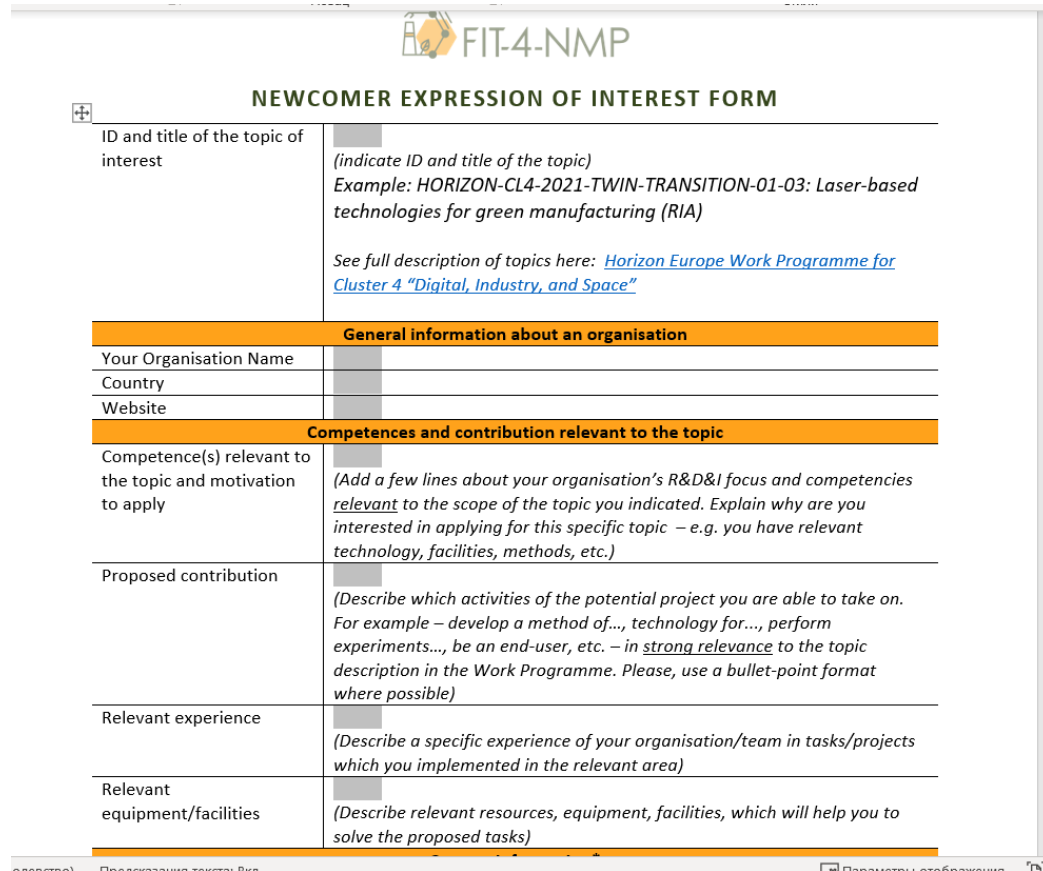
About Consortium Project Results News Publications Contact us

Organization Name	Country	Region	Organization type	Brief description of R&D and business focus
Air Force Institute of Technology	PL	PL91	REC	Composites manufacturing and structural health monitoring by non-destructive testing of structures and objects.
Alexander Dubcek University of Trencin – Faculty of Industrial Technologies in Puchov	SK	SK02	HES	Research and development of metals, polymers, silicate materials and textiles, combined with the focus on computational modelling and simulation, environmental engineering and industrial design.
Apel Laser SRL	RO	RO32	PRC	Lasers and laser-based systems manufacturer; non-conventional laser machine manufacturing process. Thin films deposition and nanosensing.
Artec3D	LU	LU00	PRC	3D scanning solutions, Computer Vision and Machine Learning, Robotics
B. Vorkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine	UA	UA20	REC	Nanophysics and nanotechnologies, superconducting resonator, quantum and cryocrystals; nanostructured superconductors; quantum sensors.
Bilkent University – Nanotechnology	TR	TR51	REC	Photonic crystals, plasmonic and left-handed materials, electromagnetism, photonic crystals and

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 Invitations Urbaniv....pdf



# COMMUNICATION WITH CURRENT PROJECTS:FIT-4-NMP



**NEWCOMER EXPRESSION OF INTEREST FORM**

ID and title of the topic of interest	<p>(indicate ID and title of the topic)  <i>Example: HORIZON-CL4-2021-TWIN-TRANSITION-01-03: Laser-based technologies for green manufacturing (RIA)</i></p> <p>See full description of topics here: <a href="#">Horizon Europe Work Programme for Cluster 4 "Digital, Industry, and Space"</a></p>
<b>General information about an organisation</b>	
Your Organisation Name	
Country	
Website	
<b>Competences and contribution relevant to the topic</b>	
Competence(s) relevant to the topic and motivation to apply	<p>(Add a few lines about your organisation's R&amp;D&amp;I focus and competencies <u>relevant</u> to the scope of the topic you indicated. Explain why are you interested in applying for this specific topic – e.g. you have relevant technology, facilities, methods, etc.)</p>
Proposed contribution	<p>(Describe which activities of the potential project you are able to take on. For example – develop a method of..., technology for..., perform experiments..., be an end-user, etc. – in <u>strong relevance</u> to the topic description in the Work Programme. Please, use a bullet-point format where possible)</p>
Relevant experience	<p>(Describe a specific experience of your organisation/team in tasks/projects which you implemented in the relevant area)</p>
Relevant equipment/facilities	<p>(Describe relevant resources, equipment, facilities, which will help you to solve the proposed tasks)</p>

## SUBMISSION OF EXPRESSION OF INTEREST FORM

Actual for chosen call

Disseminated via project partners

Disseminated via NCPs

Adding new partners to formulated consortium

***One form for one call for proposals!***

# COMMUNICATION WITH CURRENT PROJECT: COST ACTIONS

## ► COST ACTION CA19118

### **HIGH-PERFORMANCE CARBON-BASED COMPOSITES WITH SMART PROPERTIES FOR ADVANCED SENSING APPLICATIONS**

- The EsSENce COST Action aim to develop a scientific & technological innovation hub at European and International level, focusing on advanced composite materials reinforced with carbon-based nanomaterials for sensing applications. Main focus is to combine manufacturing technologies with innovative nano-enabled composite materials for fabrication of smart devices with new functionalities.

<https://www.cost.eu/actions/CA19118/>

- <http://www.essence-cost.eu/>

# PARTNER SEARCH INSTRUMENT



## Functional multi-material components and structures (RIA)

TOPIC ID: HORIZON-CL4-2022-RESILIENCE-01-12

Grant

### General information

Topic description

Destination

Conditions and documents

Partner search

Submission service

Topic related FAQ

Get support

[Go back to search results](#)

### General information

Programme

**Horizon Europe Framework Programme (HORIZON)**

Call

**[A DIGITISED, RESOURCE-EFFICIENT AND RESILIENT INDUSTRY 2022 \(HORIZON-CL4-2022-RESILIENCE-01\)](#)**

[See budget overview](#)

Type of action

**HORIZON-RIA HORIZON Research and Innovation Actions**

Type of MGA

**HORIZON Action Grant Budget-Based [HORIZON-AG]**

Forthcoming

Deadline model

**single-stage**

Planned opening date

**12 October 2021**

Deadline date

**30 March 2022 17:00:00 Brussels time**

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl4-2022-resilience-01-12>

### Partner search

40

Organisations are looking for collaborating partners for this topic

[View / Edit](#)

# PARTNER SEARCH INSTRUMENT



## Partner Search list

Results: 40				<input type="text" value="Filter.."/>	
ORGANISATION NAME ▾	REQUEST DATE ▾	ORGANISATION TYPE ▾	COUNTRY ▾	EXPERTISE REQUEST OR OFFER ▾	ACTIONS ▾
EPSILON MALTA LIMITED					
<p>For this TOPIC, EPSILON Malta Ltd (<a href="http://www.epsilonmalta.com">www.epsilonmalta.com</a>) can offer: Digital twins concepts for multi-material components and structures, LCA for alternatives at life-cycle, DSS modeling for strategies, Circular Economics, EEIG, see <a href="https://shippingsaas.eu/">https://shippingsaas.eu/</a>, <a href="https://vesselslife.com/">https://vesselslife.com/</a>. -&gt; Info: Prof. M. Bonazountas, <a href="mailto:bonazountas@epsilon.gr">bonazountas@epsilon.gr</a></p>	28-Sep-2021	Small or medium-size enterprise	MT	Expertise offer	<a href="#">Actions</a>
CONSIGLIO NAZIONALE DELLE RICERCHE					
<p>The CNR Institute for Microelectronics and Microsystems (IMM) is a public research institute focused in the fields of chemical/physical sensors for environment, microphysiological and microfluidic systems engineering, cleanroom micro/nanofabrication and MEMS devices design and simulation. Expertise on growth/characterization piezoelectric thin films of</p>	28-Sep-2021	Research Organisation	IT	Expertise offer	<a href="#">Actions</a>

# THANK YOU FOR YOUR ATTENTION!

## SUCCESSFUL PROJECTS TO YOU AND YOUR PARTNERS!



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