Co-funded by the European Union

ΕΣΠΑ 2021-2027
Βιώσιμη Ανάπτυξη για Όλους
Partnership Agreement 2021-2027

Programme Central Macedonia

Programme: "CENTRAL MACEDONIA" 2021–2027

Action: "Investments for the creation, expansion or upgrading of RTDI infrastructure in public academic or research institutions in the Region of Central Macedonia"

Project Title:

«Purchase of High Resolution Transmission Electron Microscope HR-TEM for nano-scale exploring the composition and structure of cutting-edge materials (Nano_sysTEM)».

Description:

The Centre for Research & Technology Hellas (CERTH), is participating in the "Central Macedonia" Programme of the "Partnership Agreement on Regional Development 2021-2027" through the Action "Investments for the creation, expansion or up grading of RTDI infrastructure in public academic or research institutions in the Region of Central Macedonia" co-funded by the European Union and National Resources.

The project titled « Purchase of High Resolution Transmission Electron Microscope HR-TEM for nano-scale exploring the composition and structure of cutting-edge materials (Nano_sysTEM) concerns a high-resolution transmission/scanning electron microscope system with a Field Emission Gun (FEG), combined with a microanalysis system. It constitutes an essential and highly advanced equipment for the characterization of a wide range of nanomaterials in cutting-edge technologies, of great interest both to the research community and to industry.

Thus, the procurement of this infrastructure aims, from the perspective of materials development/optimization, to support all environmental, energy-related, bioscientific, etc., interests and research activities of the Laboratory of Inorganic Materials (LIM) of CPERI/CERTH, as well as CPERI as a whole, which display strong relevance across various fields. These research activities relate to the development of innovative materials with numerous direct applications falling under the priority area '**Materials, Manufacturing and Industry'** and target research, industrial production, or processing activities.

In line with national and regional priorities of the 2021-2027 programming period, the project aims at generating new knowledge and fostering innovation through:

(1) 'Processes, **equipment** and systems for the transition to **climate-neutral industrial production**' within the corresponding RIS3 value chain:

- Development of industrial production or processing methods with the goal of improved carbon footprint and/or use of renewable energy sources and/or climate-neutral fuels and/or waste reduction

- Design, modelling, and development of industrial production processes with emphasis on the use of renewable energy sources or climate-neutral fuels
- Innovative methods and systems for the sustainable utilization or management of natural resources for industrial use
- Collection, storage, and utilization of CO_2 from industrial flue gases, including conversion into useful products and storage
- Nanomaterials, advanced and innovative composite materials for high-performance industrial applications with low environmental impact

(2) '**Materials**, processes, devices & systems for the **circular economy** and **industrial symbiosis**' within the corresponding RIS3 value chain:

- Technologies and tools for the valorisation of secondary materials, by-products, waste from processes, and end-of-life products
- Utilization of municipal or industrial waste as alternative sources of materials or fuels for industrial use
- Materials, devices, and technologies for water collection, management, and recycling

as well as in the sub-sector:

(3) 'Raw materials, **industrial materials**, packaging materials, **consumer products** – Production processes' within the corresponding RIS3 value chain:

- Development of materials and processes for highly demanding environments
- Design, development, and production processes for polymers, biopolymers, etc.
- Design, development, and production processes for composite materials and systems with enhanced properties

Indicative expected benefits of this specific project, through its included interventions, relate primarily to the fact that it concerns a horizontally applicable instrument that will serve as a foundational tool for multiple research projects and strengthen the implementation of many innovative technologies. Its key advantages include the enhancement of the Institute's competitiveness, its ability to attract funding and high-level researchers, and ultimately, through the advancement of knowledge, the increased likelihood of implementing innovative technologies in various research fields that exhibit strong relevance to numerous RIS3 regional priorities, as described above.

The objective of the project is that, through the new infrastructure, the innovation potential of research conducted at the Laboratory of Inorganic Materials (LIM) of CPERI/CERTH—and CPERI as a whole—is strengthened. This research relates to the development of innovative materials with numerous direct applications in the priority area '**Materials, Manufacturing and Industry,**' targeting improved carbon footprint and/or the use of renewable energy sources and/or climate-neutral fuels and/or waste reduction; processes for the collection, storage and utilization of CO_2 from industrial flue gases, including conversion into useful products and storage; production processes for polymers, biopolymers, etc., and for composite materials and systems with enhanced properties; nanomaterials, advanced and innovative composite materials for industrial applications with low environmental impact; materials, devices and technologies for water collection, management and recycling;

biomedical applications; as well as innovative methods and systems for sustainable exploitation or management of natural resources.

The development of all the above research processes includes the preparation of advanced materials and their testing at both laboratory and pilot scale, as well as their full physicochemical characterization: identification of chemical components, crystalline phases, and morphological features present in the materials of interest, and investigation of the changes they undergo during chemical processes. However, the most important conclusions relate to linking material performance with their physicochemical characteristics and to further designing these materials with improved performance through targeted modifications of those characteristics."

Duration: 16/6/2025-31/12/2027

Total Project Budget: *1.000.000,00€*