



Institutul Național de Cercetare-Dezvoltare pentru Chimie și Petrochimie - ICECHIM București



22nd Edition of the International Exhibition of Research,
Innovations and Inventions – PRO INVENT
15 – 17 October 2025



COMPOSITE BASED ON RAW MATERIALS OF NATURAL ORIGIN FOR THE
ADSORPTION OF HEAVY METALS AND METHOD OF OBTAINING IT

Radu Claudiu FIERASCU, Irina FIERASCU, Toma FISTOS, Anda Maria BAROI,
Ioana Silvia HOSU, Roxana Ioana MATEI, Irina-Elena CHICAN

Patent application No. 00334/2025

The present invention relates to a composite material and a method for obtaining it, intended for the removal of heavy metals from aqueous environments, particularly at low concentrations and under real usage conditions. The invention falls within the field of contaminated water treatment and environmental protection, addressing a pressing need for efficient, sustainable, and environmentally friendly solutions for water depollution. The proposed material consists of an active layer obtained by combining natural-origin materials – hydroxyapatite, vermiculite, and perlite – each contributing specific functional properties to the overall performance of the adsorption system. Through the synergy of these natural components, the resulting material exhibits superior efficiency in removing heavy metals under real contamination conditions (variable pH, presence of other competing ions, ambient temperature, etc.). The method of obtaining the material consists of four steps, is simple, scalable, and does not involve costly synthesis processes, making it suitable for industrial and/or municipal applications.


1st step


2nd step


3rd step


4th step


Final application

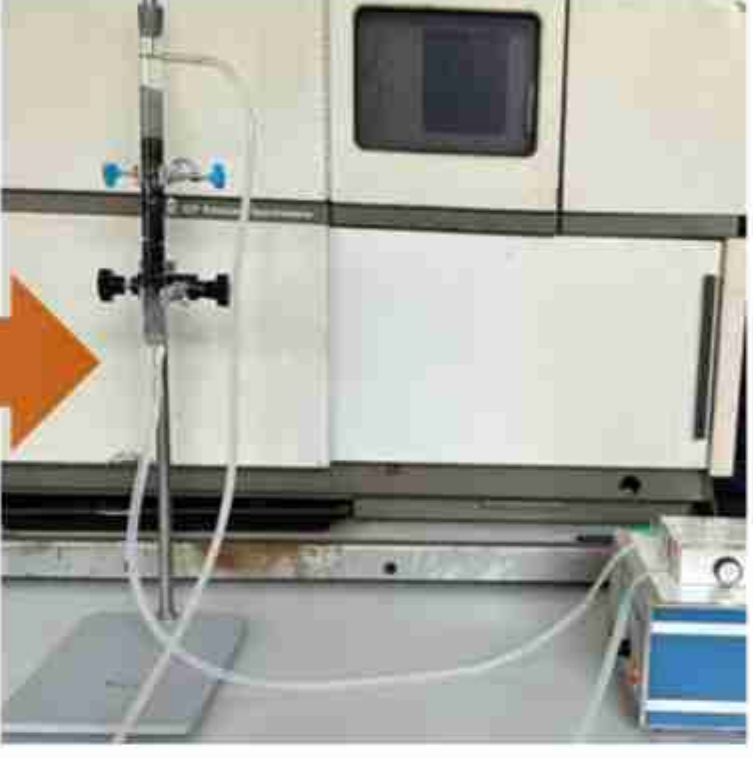












HAP

HAP composite

Activated vermiculite

Perlite

Adsorption column

Adsorption process

AVANTAGES

Stability and affinity for the adsorption of heavy metals at ambient temperature, atmospheric pressure, and within the pH range typically found in aqueous effluents;

Reproducible in terms of its physico-structural properties;

Well-known and low-cost obtaining methods;

No secondary pollution (sludge, ash, etc.);

Possibility of usage in accidental pollution involving high concentrations of pollutants.

Concentration (mg/kg)

500000

400000

300000

200000

100000

0

After continuous experiment

Component 1

Component 2

Component 3

Element

Ca

P

O

Si

Al

Fe

Mg

Na

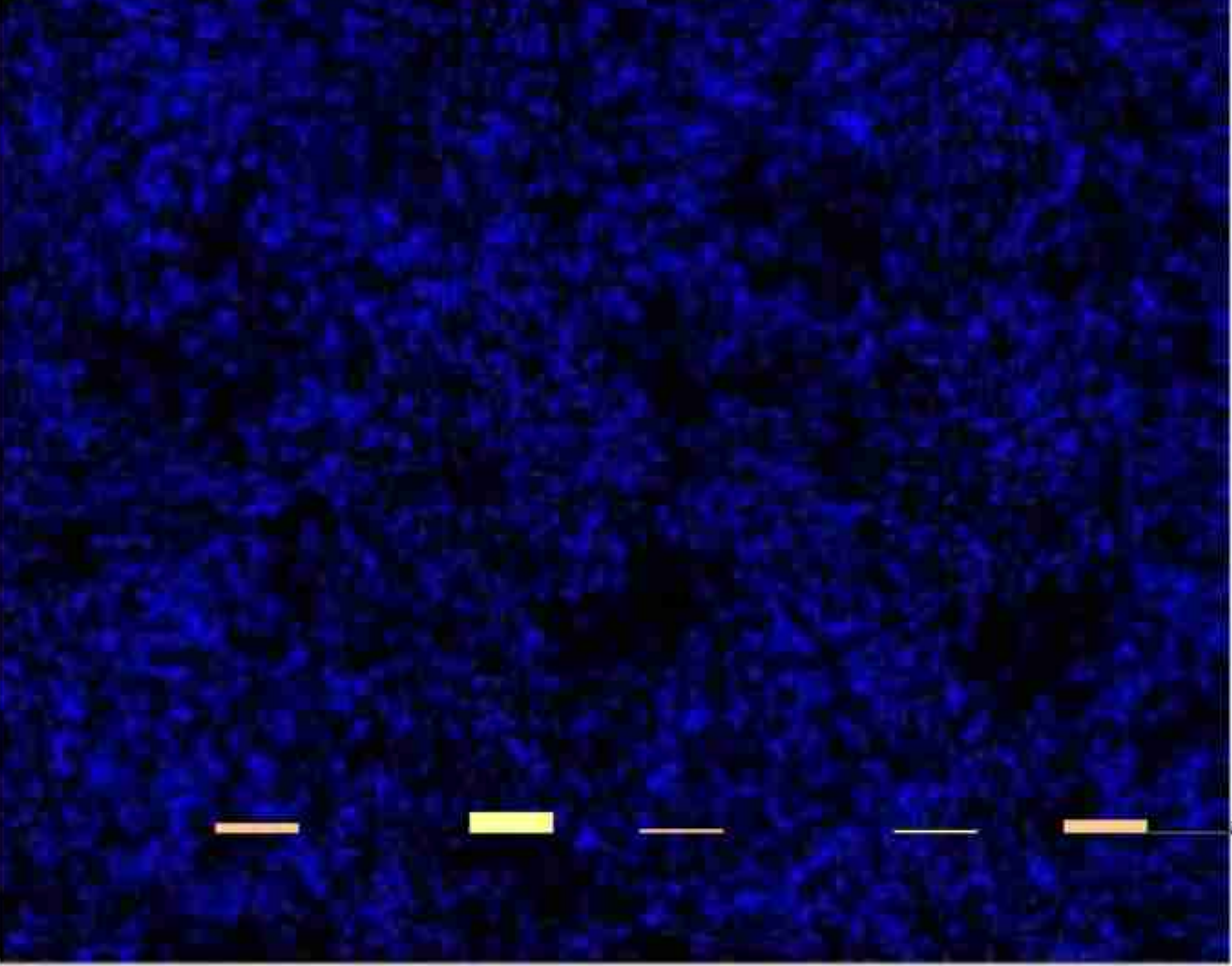
K

Cl

S

Other

Elemental composition (XRF) of composite after continuous experiment vs. individual components.



500µm

Cd adsorption on the material – EDX data.

Cd (mg/L)

10

8

6

4

2

0

Time (min.)

0

200

400

600

800

1000

1200

1400

Discontinuous system

C_p (mg/L)

5

4

3

2

1

0

Time (min.)

0

30

60

90

120

150

180

210

240

Continuous system


ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support of the Ministry of Research, Innovation and Digitization (Ministry of Education and Research, National Authority for Research) through the PN 23.06 Core Program – ChemNewDeal, project no. PN 23.06.01.01 – AquaMat, within PN IV.


CONTACT

Technical manager: PhD Habil Radu Claudiu Fierascu

fierascu.radu@icechim.ro



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COMPOSITE MATERIAL FOR ORGANIC POLLUTANTS
REMOVAL USING MATERIALS BASED ON FOOD WASTE
AND PROCEDURE FOR OBTAINING IT

Roxana Ioana BRAZDIS (MATEI), Irina FIERASCU, Toma FISTOS, Anda Maria BAROI,
Ioana Silvia HOSU, Radu Claudiu FIERASCU, Valentin RADITOIU,
Monica Florentina RADULY, Maria GRAPIN


Patent application No. 00673/2024

The present invention refers to a material and procedure for the removal of organic pollutants. The procedure is based on the use of a phosphatic material (obtained from the valorization of food wastes-shells of *Mya arenaria* Linnaeus, 1758 - the most encountered edible clam on the Black Sea shore), decorated with metallic oxides (Cu or Ni) developed using a rapid approach, further formulated as an active coating. The material proved to be effective at low concentrations against the model organic pollutant (dye) Methylene Blue.

Synthesis

Characterization

Applications



Grinding

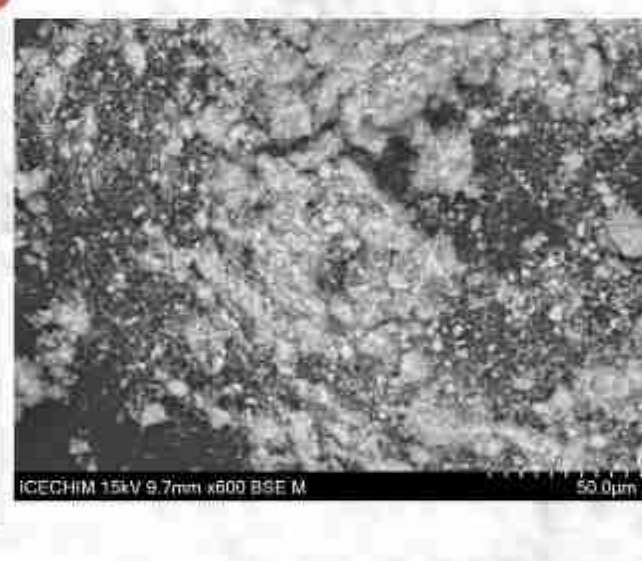
Obtained materials:

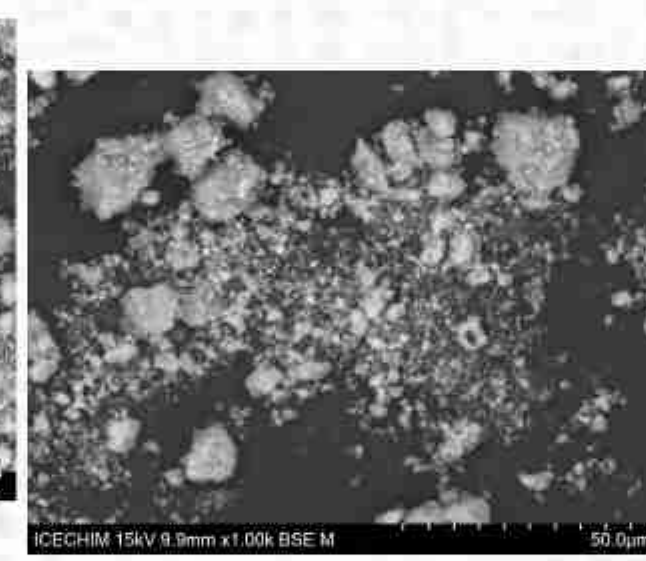
Bio-derived phosphatic material/Cu

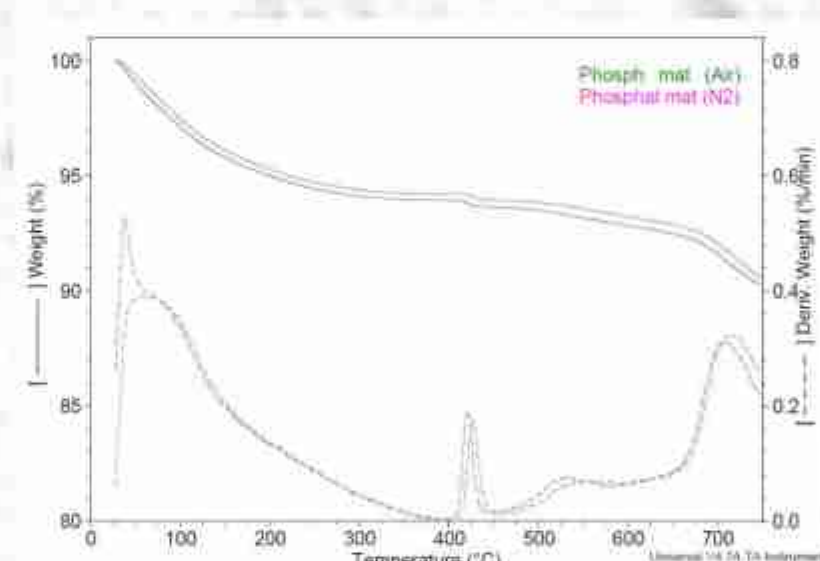
Bio-derived phosphatic material/Co

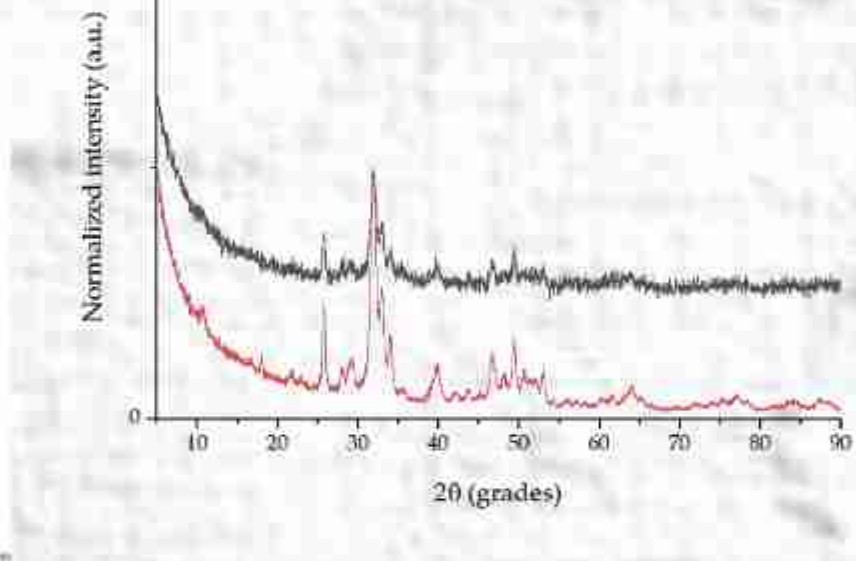
Mya arenaria Linnaeus, 1758
(Clams - Food waste)

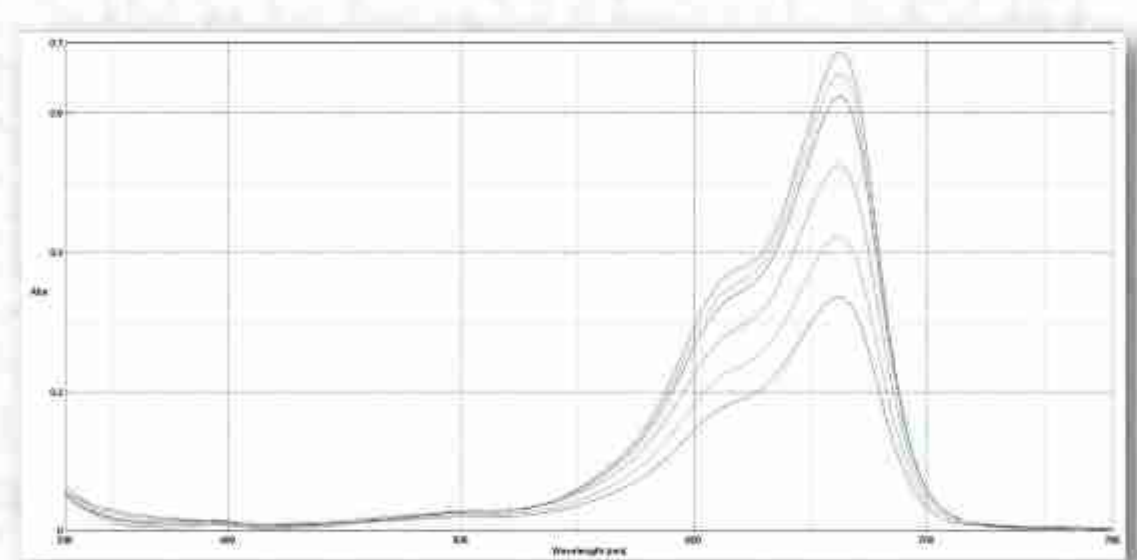
Used as CaO precursor in phosphatic material synthesis

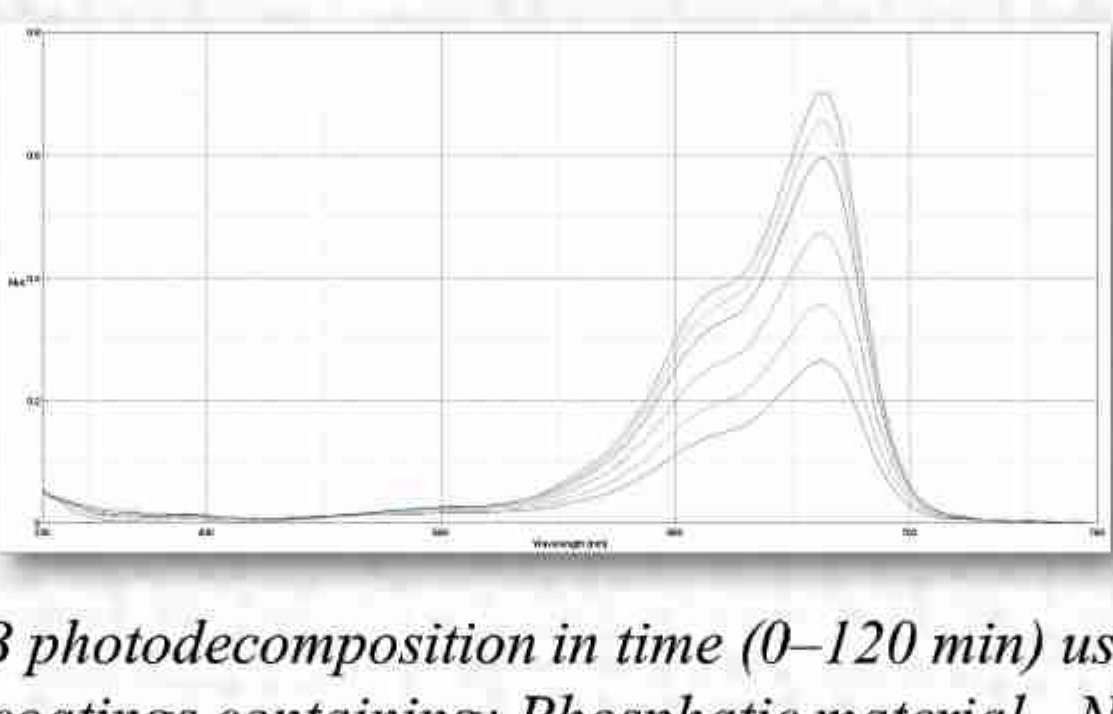


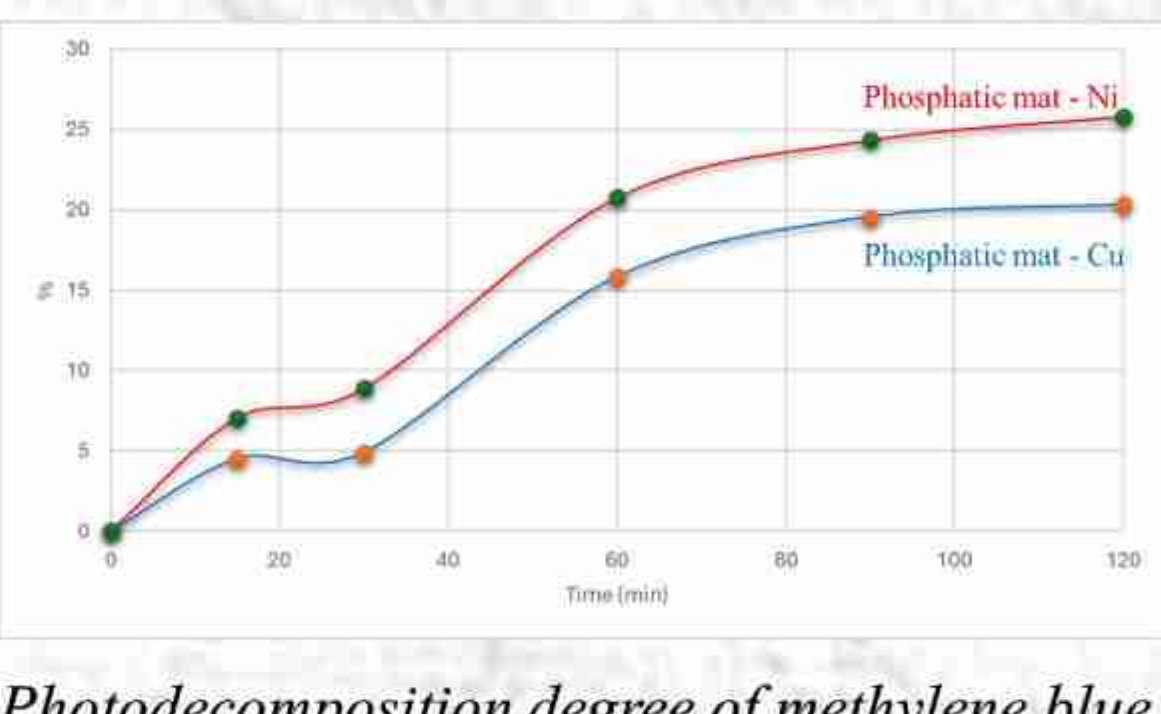












MB photodecomposition in time (0–120 min) using coatings containing: Phosphatic material-Cu

MB photodecomposition in time (0–120 min) using coatings containing: Phosphatic material - Ni

Photodecomposition degree of methylene blue using coatings containing phosphatic materials

ADVANTAGES

A method to capitalize food (clams) wastes into value-added compounds

A rapid method for decorating the phosphatic material

Efficient in the removal of organic pollutants

An easy method to practically use the decorated materials

Easy scalable to industrial production

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support of the Ministry of Research, Innovation and Digitization (Ministry of Education and Research, National Authority for Research) through the PN 23.06 Core Program – ChemNewDeal, project no. PN 23.06.01.01 – AquaMat, within PN IV.

CONTACT

Technical manager: PhD Habil Radu Claudiu Fierascu

fierascu.radu@icechim.ro

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TRANSDISCIPLINARY APPROACH FOR MODERN FORMULATION OF
BUILDING MATERIALS - PARADIGM SHIFT IN THE
PROTECTION OF IMMOVABLE CULTURAL HERITAGE
ConstructHer

Irina FIERASCU, Adriana MOANTA, Radu Claudiu FIERASCU, Toma FISTOS,
Ionela PETRE, Jenica PACEAGIU

Research Project PN-IV-P7-7.1-PED-2024-0286
Contract 77PED/2025 - Experimental-demonstrative project



General information

Contracting authority: Executive Unit for Financing Higher
Education, Research, Development and Innovation (UEFISCDI)
Implementation period: 05/05/2025-04/05/2027
Budget: 843.512 lei
Project director: Dr. Habil. Irina Fierăscu

Partners



National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project director:
Dr. Habil. Irina FIERĂSCU

CEPROCIM SA
Project responsible:
Dr. Eng. Adriana MOANȚĂ

General objective

ConstructHer project proposes a promising, cost-effective and environmentally friendly alternative to currently used solutions with multivalent use (both for the protection of cultural heritage, as well as for civil constructions with special requirements, such as hospitals, areas with zero microbial contamination, etc.), based on the development of technologies for obtaining construction materials (plaster mortars, cement, plaster) with biocidal and photocatalytic properties, by enriching them with natural compounds and metal nanoparticles obtained by “green chemistry” methods from natural resources (plant extracts).





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INNOVATIVE APPROACH FOR THE PROTECTION OF MEDICINAL AND AROMATIC
PLANT CROPS - BETWEEN CIRCULAR BIOECONOMY AND NANOTECHNOLOGY

Radu Claudiu FIERASCU, Daniela IONESCU, Irina FIERASCU, Anda Maria BAROI,
Cristina Emanuela ENASCUTA, Justinian-Andrei TOMESCU, Stefan BUHAEV,
Cristina Mihaela LUNTRARU



BioEcoNan

PN-IV-P7-7.1-PED-2024-0318
Contract 85PED/2025 - Experimental-demonstrative project

General information

Contracting authority: Executive Unit for Financing Higher
Education, Research, Development and Innovation (UEFISCDI)
Implementation period: 05/05/2025-04/05/2027
Total budget: 848.197 lei
Project director: Dr. Habil. Radu Claudiu Fierăscu

Partners



National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project director:
Dr. Habil. Radu Claudiu FIERĂSCU

SC Hofigal Export-Import SA
Project responsible :
Dr. Eng. Daniela IONESCU

General objective

The project Innovative approach for the protection of medicinal and aromatic plant crops - between circular bioeconomy and nanotechnology (BioEcoNan) proposes a circular approach for the protection and enhancement of medicinal and aromatic plant crops, in which the vegetal wastes of a plant are used to develop modern tools for its own protection.

Expected results

- Dedicated solutions (incorporating vegetal wastes and phytosynthesized nanomaterials) acting not only as a protection against the biocenotic stress agents (particularly the fungal and bacterial diseases), but also as biostimulants;
- 8 participations in scientific events;
- 4 scientific papers submitted for publication in Web of Science/Clarivate journals;
- Organization of one workshop on the project;
- Two patent applications;
- Other communication and dissemination actions.



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**BEE-HIVE BASED ACTIVE PRINCIPLES INTENSIFIED EXTRACTION AND
SMART ENCAPSULATION FOR CONTROLLED RELEASE: A SYNERGISTIC
BIOECONOMY AND BIOENGINEERING APPROACH**

Cristina Emanuela ENASCUTA, Manuel DRUGULESCU, Irina FIERASCU,
Elena-Emilia SIRBU, Radu Claudiu FIERASCU, Vasile LAVRIC

BeeProdCaps

Research Project PN-IV-P7-7.1-PED-2024-0973

Contract 86PED/2025 - Experimental-demonstrative project

General information



Contracting authority: Executive Unit for Financing Higher
Education, Research, Development and Innovation (UEFISCDI)

Implementation period: 05/05/2025-04/05/2027

Budget: 797.357 lei

Project director: Dr. eng. Cristina-Emanuela Enășcuță





National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project director:
Dr. eng. Cristina-Emanuela Enășcuță

Partners



ACTIV CPC&I SRL
Project responsible:
Dr. eng. Manuel Drugulescu

General objective

The main objective of the project „*Bee-hive based active principles intensified extraction and smart encapsulation for controlled release: a synergistic bioeconomy and bioengineering approach*” is to develop an efficient technology, validated at laboratory scale, for effective extraction and encapsulation of bioactive compounds from bee products with targeted release time profile of the formers, according to the pH environment.

Also, through this project proposal, a new direction of research in terms of obtaining new nutraceutical products will be opened, by developing new innovative methods of extraction, separation and microencapsulation of bioactive compounds.





CONTACT
Cristina-Emanuela ENASCUTA
Email: cristina.enascuta@icechim.ro



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**DEVELOPMENT OF ECO-FRIENDLY SOLUTIONS BASED ON SILANES
AND NANOPARTICLES FOR THE CONSOLIDATION OF BUILDINGS
AND MONUMENTS**

Madalin Vasile COMAN, Radu Claudiu FIERASCU, Denisa FICAI, Ionel Claudiu BADEA,
Andrei Dragos MARCU, Roxana Ioana MATEI, Irina FIERASCU, Irina Elena CHICAN,
Cristian-Andi NICOLAE, Ludmila MOTELICA, Roxana Doina TRUSCA, Ovidiu Cristian OPREA, Anton FICAI

NanoConsol

Research Project PN-IV-P7-7.1-PTE-2024-0522

Contract 47PTE/2025 – Transfer to economic operator project

General information



Contracting authority: Executive Unit for Financing Higher Education, Research, Development
and Innovation (UEFISCDI)

Implementation period: 05/05/2025 – 04/05/2027

Total budget: 1.896.075 lei

ICECHIM budget: 373.275 lei

Project responsible: Dr. Habil. Radu Claudiu FIERĂSCU





POPP & ASOCIAȚII SRL
Project director:
Dr. Eng. Mădălin Vasile COMAN

Partners



National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project responsible:
Dr. Habil. Radu Claudiu FIERĂSCU



National University of Science and
Technology POLITEHNICA
Bucharest
Project responsible:
Assoc. Prof. Dr. Eng. Denisa FICAI

General objective

The goal of the project *Development of eco-friendly solutions based on silanes and nanoparticles for the consolidation of buildings and monuments (NanoConsol)* is the transfer and development of a consolidation technology (based on innovative nanomaterials with self-healing and antimicrobial properties), dedicated to various types of materials that make up buildings and monuments (with a focus on immovable heritage objectives), to an economic agent with experience in creating and applying solutions for the consolidation of such structures.







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ADVANCED ECOLOGICAL SOLUTIONS FOR INCREASING FOOD SAFETY OF FRUITS AND VEGETABLES, FROM PRODUCER TO CONSUMER

Daniela IONESCU, Irina Elena CHICAN, Alina ORTAN, Justinian-Andrei TOMESCU,
Cristina Mihaela LUNTRARU, Maria IVOPOL, Stefan BUHAEV, Gabriela Denisa RIZEA,
Alexandra ENE-MANEA, Irina FIERASCU, Radu Claudiu FIERASCU, Cristina-Emanuela ENASCUTA,
Simona Marcu SPINU, Mihaela Dragoi CUDALBEANU, Carmen Laura CIMPEANU

SIGUR



Research Project PN-IV-P7-7.1-PTE-2024-0607
Contract 57PTE/2025 – Transfer to economic operator project

General information

Contracting authority: Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI)
Implementation period: 02/06/2025-31/05/2027
Total budget: 1.884.538 lei
ICECHIM budget: 375.000 lei
Project lead: Dr. Eng. Irina Elena CHICAN

Partners



SC Hofigal Export Import SA
Project director:
Dr. Eng. Daniela IONESCU



National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project responsible:
Dr. Eng. Irina Elena CHICAN



University of Agronomic
Sciences and Veterinary
Medicine of Bucharest
Project responsible:
**Prof. Univ. Dr. Alina Ruxandra
Eugenia ORȚAN**

General objective

Advanced ecological solutions for increasing food safety of fruits and vegetables, from producer to consumer (**SIGUR**) aims to make a significant contribution to the development of an innovative and ecological solution for washing fruits and vegetables, which ensures the efficient removal of harmful contaminants, without compromising food quality or safety. Also, the project aims to provide a complete solution, the first at national level, to be implemented on a large scale and to contribute to improving public health and protecting the environment.



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BIO-INSPIRED SYSTEMS BASE ON INTERFERENCE PIGMENTS USED AS EXTENDED UV-LIGHT SHIELDING MATERIALS

Florentina Monica RADULY, Teodor PANAIT

BISUVSHIELD

General information

Contracting authority: Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI)
Research project: PN-IV-P7-7.1-PED-2024-0838
Contract 117PED/2025 - Experimental-demonstrative project
Implementation period: 05/05/2025-05/05/2027
Project Budget: 746.162 lei
Project director: Florentina-Monica RADULY



National Institute for Research & Development
in Chemistry and Petrochemistry -
ICECHIM Bucharest
Project director:
Dr. eng. Florentina-Monica RADULY



PANAIT INTL SRL
Project responsible:
Giorgiu Toader PANAIT

The research topic of the proposed project will be realized through a partnership between a research institute and a entrepreneur in the field of cosmetics products, and aims at the development, morphological and structural characterization of some coumarin compounds of natural and synthetic origin deposited on mica mineral to present shielding properties against UV and near UV rays corresponding to the blue light emitted by LED systems. The obtained hybrid materials will be studied, optimized and tested through biochemical and physical analyses, then incorporated into emulsified systems to track their photoprotective effects and the processes through which they occur.

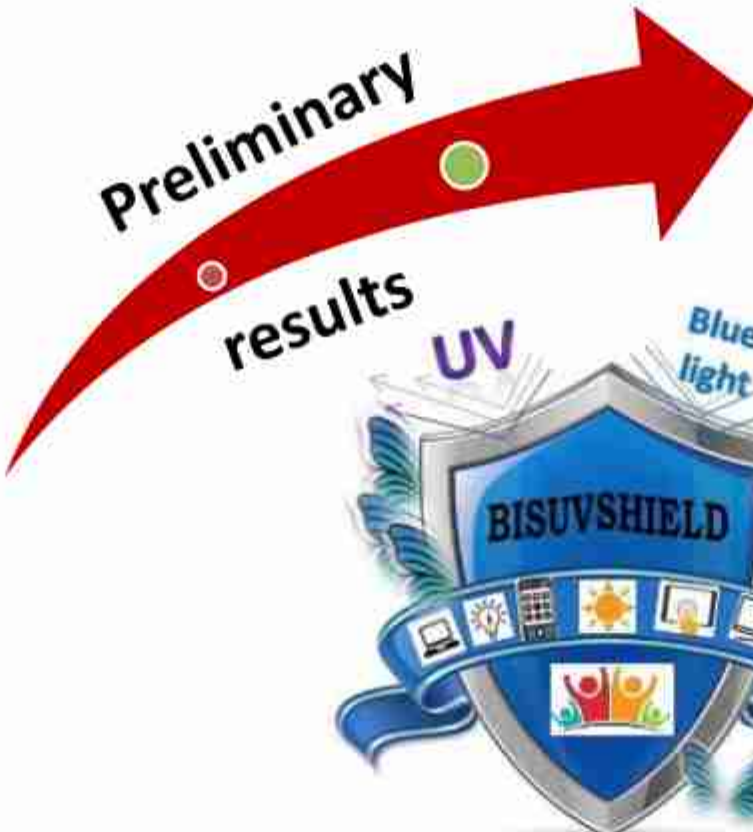
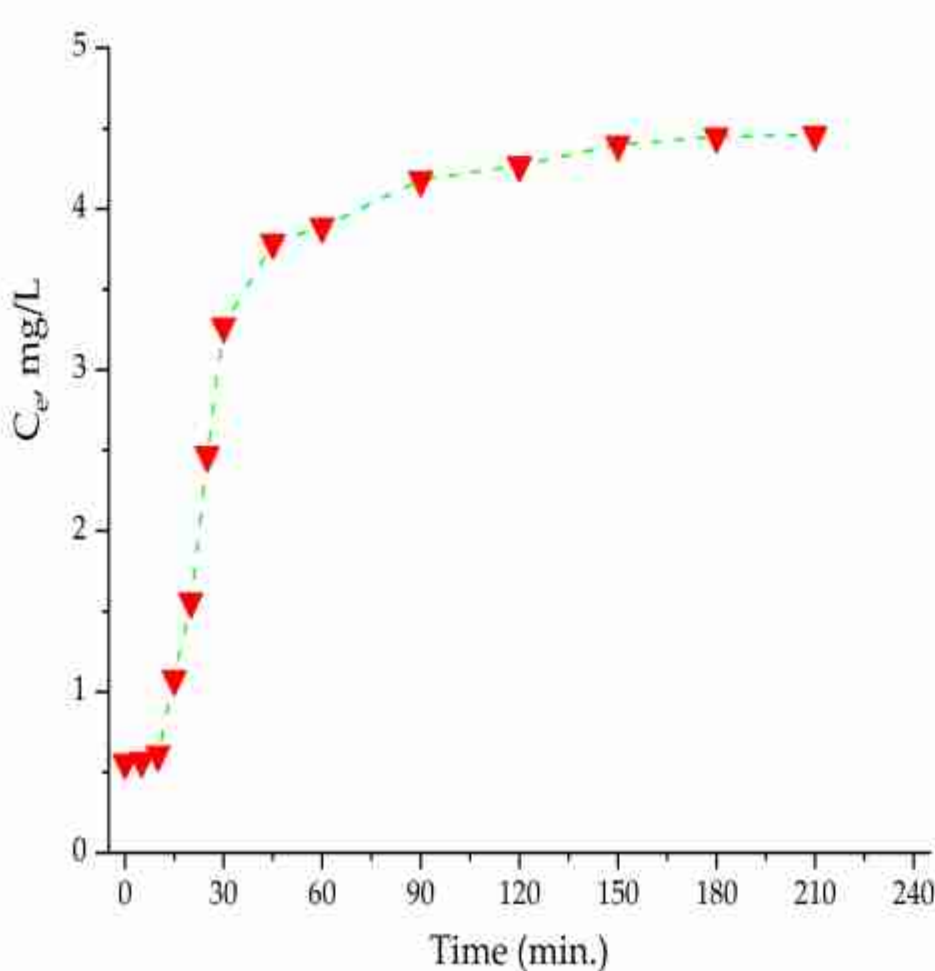
Objectives

The selection of fluorescent natural compounds with antioxidant properties from sustainable sources and the synthesis of analogous derivatives with a coumarin structure.

Development of small size mica with different desing to favor the adsorption process of coumarin derivatives and obtain hybrid materials with multiple optical properties.

Demonstration and validation of the compatibility of hybrid materials with different types of emulsion systems used in cosmetics sunscreen products.

Estimated results



INTERFERENCE PIGMENTS BASED ON MICA AND NATURAL RED CLOVER EXTRACTS FOR COSMETIC APPLICATIONS



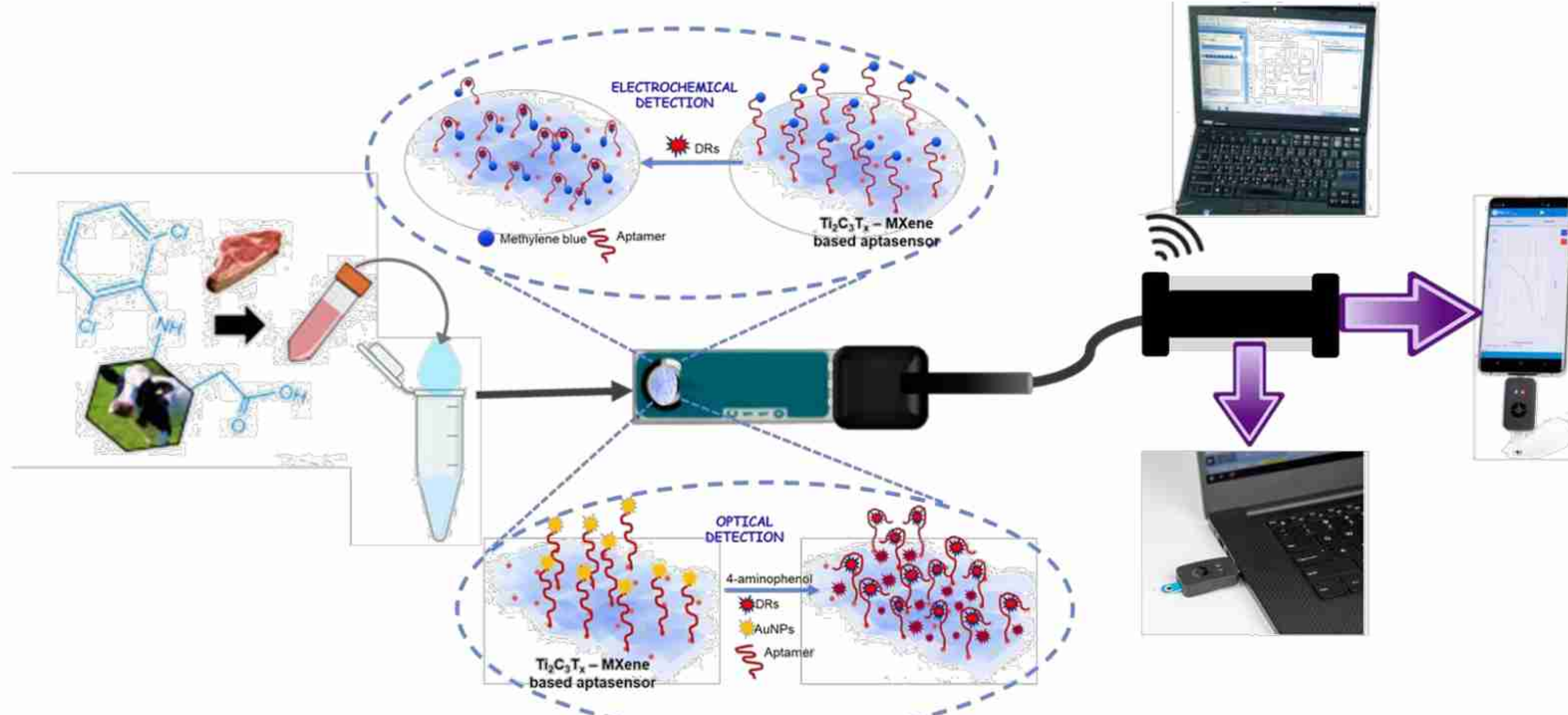
HYBRID MATERIALS BASED ON METAL COMPLEXES WITH POLYPHENOLS FROM TARAXACUM OFFICINALE FOR UV RADIATION SHIELDING APPLICATIONS



SOL-GEL HYBRID FILMS CONTAINING BN-C NANOSTRUCTURES: DEPOSITION AND FUNCTIONAL CHARACTERIZATION

Contact:

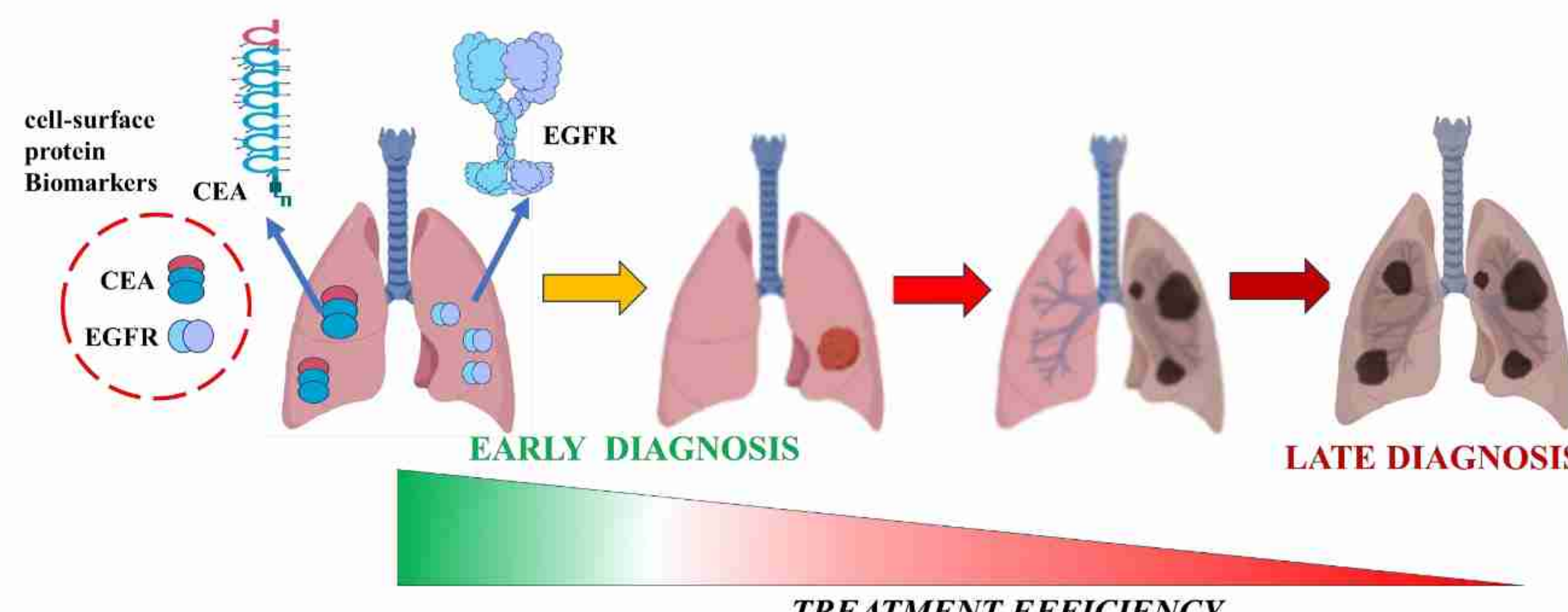
Project director: **Dr.ing. Florentina Monica Raduly**
Tel.: +40 21 316.30.62/118; Fax: +40 21 312.34.93, E-mail: monica.raduly@icechim.ro
Web: <https://icechim.ro/project/sisteme-bio-inspirate-bazate-pe-pigmenti-de-interferenta-utilizati-ca-materiale-de-ecranare-a-luminii-uv-extinsa-bisuvshield/>



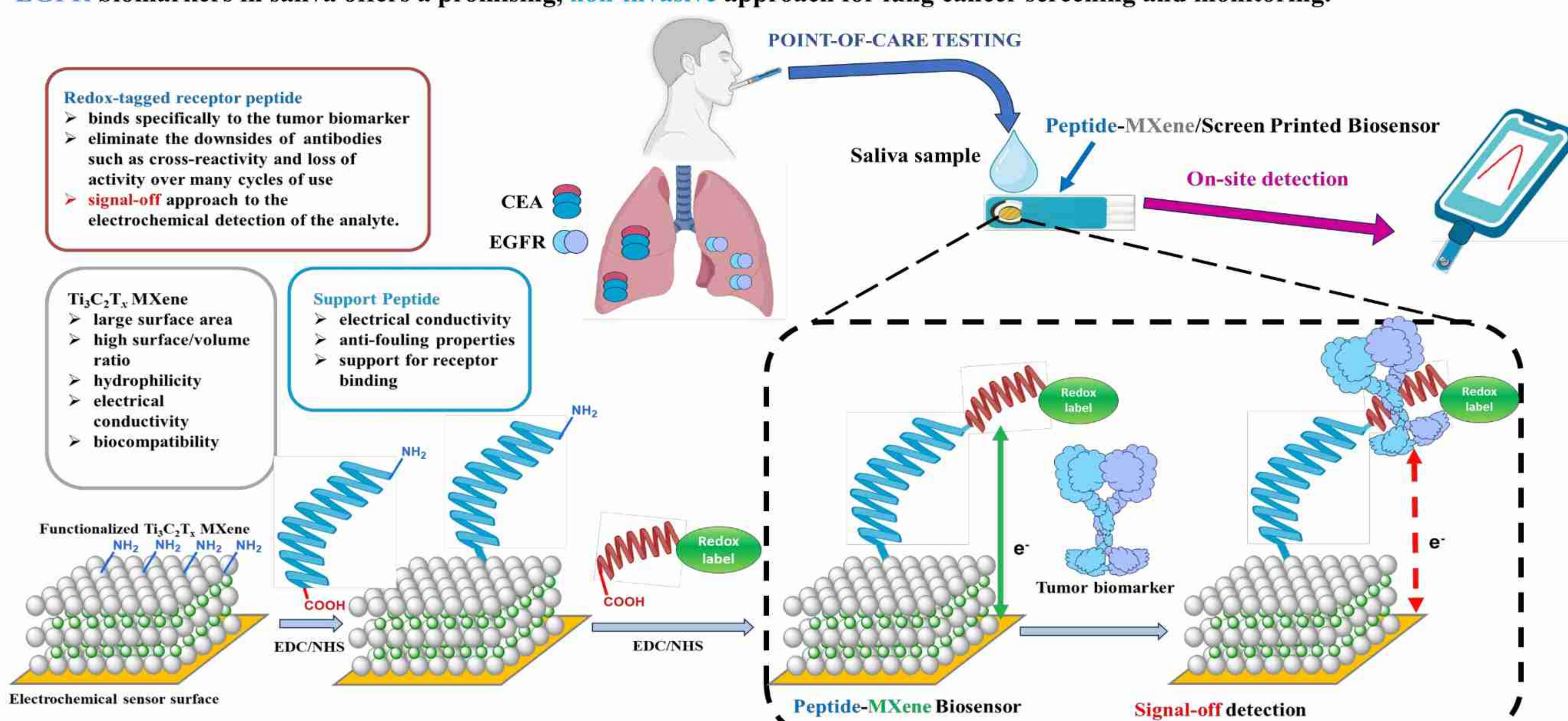
CONTACT
Dr. chem. Ana-Maria GURBAN
Email: ana-maria.gurban@icechim.ro



- The detection of CEA and EGFR biomarkers enables early diagnosis of lung cancer, when treatment is most effective. Late diagnosis often occurs at advanced stages (III–IV), reducing treatment efficiency.



- Saliva-based testing is simple, cost-effective, and patient-friendly, enabling early detection and disease management. Identifying these specific biomarkers can improve prognosis, guide therapy, and support personalized treatment strategies. Detection of **CEA** and **EGFR** biomarkers in saliva offers a promising, **non-invasive** approach for lung cancer screening and monitoring.



CONTACT
Dr. chem. Lucian-Gabriel ZAMFIR
Email: lucian.zamfir@icechim.ro

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Next-generation biodegradable filters for water purification and desalination

Tanta-Verona Iordache, Francois Xavier Perrin, Michal Ceglowski, Andreea Olaru,
Thierry Carlin, Robert Maciejewski, Adriana Nicoleta Frone

Water is the most abundant and indispensable resource of our planet. However, freshwater distribution is very different from region to region, which brings with it a very problematic scenario for drinking water availability, especially following hydro-climatic extreme events. One viable and low-cost solution to provide direct access to drinking water, refers to implementing Point-Of-Use (POU) systems for water purification and desalination. Yet, before doing so, the issues identified by end-users/ consumers regarding filters disposal and recycling should be properly addressed.

❖ **Aim of WATER-BIOFIL:** design& assemble& test 3in1 next generation compostable filters, prepared from biodegradable polymers and/or bio-sourced polymers, which can be thereafter integrated in regular POU systems, and further serve their purpose, while diminishing the environmental impact of hazardous materials.



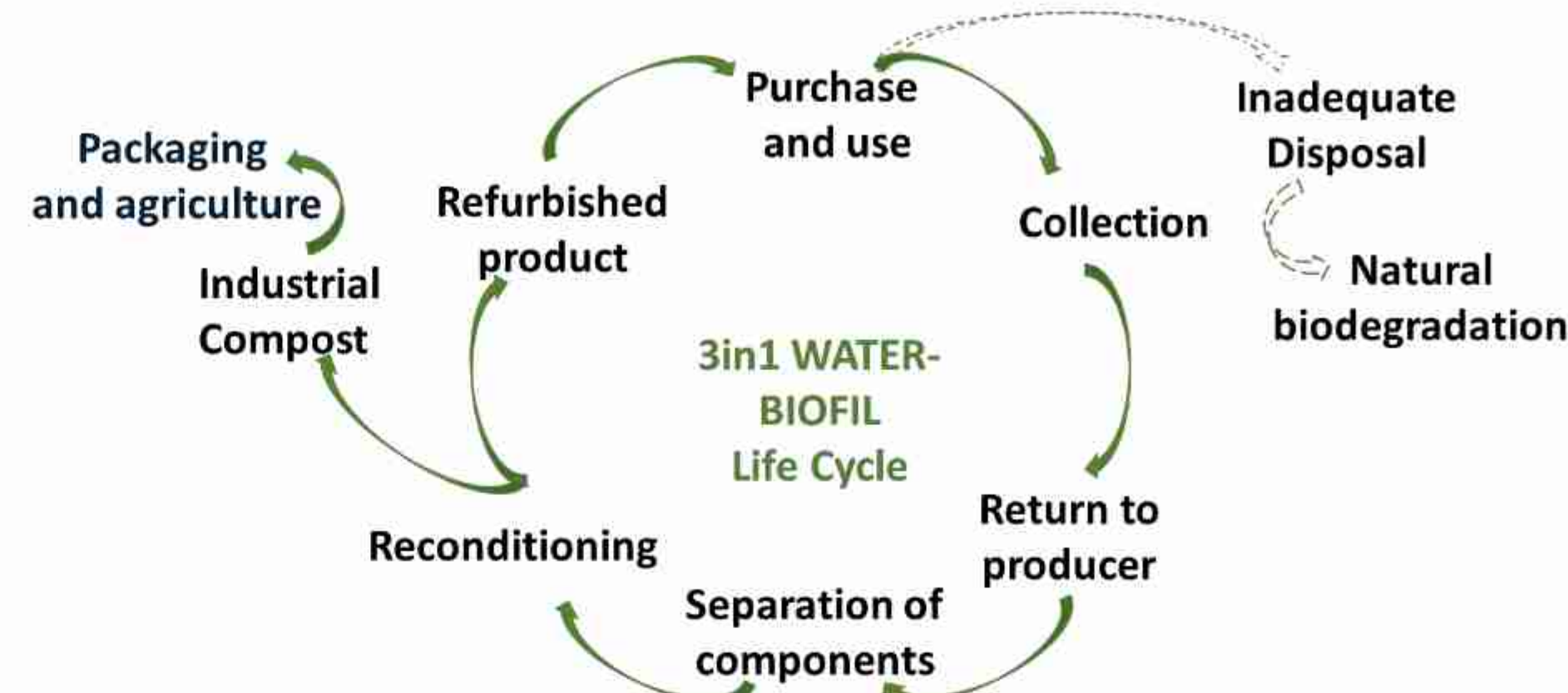
A. Regular commercial design of POU systems



B. Design of POU systems that include next generation filters

❖ **Project consortium** is joining technology developers and integrators, from Romania, France and Poland, as follows:

- National Institute for Research & Development in Chemistry and Petrochemistry **ICECHIM**, as project coordinator, Team led by CSI Dr. Tanta-Verona IORDACHE – **materials science**
- University of Toulon – **MAPIEM** Lab, Team led by Prof. Dr. Francois-Xavier PERRIN — **materials science**
- Adam Mickiewicz University (**AMU**), Team led by Prof. Dr. Michal CEGLOWSKI- – **materials science**
- EDAS-EXIM SRL**, Team led by CSIII Dr. Andreea Gabriela OLARU - **water purification**
- MarineTech**, Team led by Eng. Thierry CARLIN – **water desalination**
- PRESSEKO**, Team led by Eng. Robert MACIEJEWSKI - **waste management**



❖ **Estimated Results of WATER-BIOFIL:**

- R1.** Biodegradable filler materials, for retaining metal ion traces, dyes, organic residues, and salt ions
- R2.** Biodegradable cartridge prototypes that are easy to integrate in the production line of filters manufacturers for water purification
- R3.** End-of-use strategies applicable to the next generation filters
- R4.** Feasibility study for the potential/ future market release of the next generation filters
- R5.** Key indicators: WoS Open Access publications in collaboration, Communications to international Symposia & Conferences & Invention Salon, Patent Applications, Workshops.



Acknowledgement: Project Partners would like to thank the European Commission and [UEFISCDI, ANR and NCBR] for funding in the frame of the collaborative international consortium [WATER-BIOFIL] financed under the 2022 Joint call of the European Partnership 101060874 — Water4All.



MEMBRĂ A



**Salon Internațional
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Inovării și Inventicii**