

International Symposium **P R I O C H E M X X I**

organized by National Institute of R&D for Chemistry and Petrochemistry

ICECHIM Bucharest, ROMANIA

R o u n d T a b l e

Research and Innovation – Societal Impact

Moderator:

Dr. Nicolae Varachiu - ICECHIM



14 October 2025 Bucharest, Romania







- ***Make innovation happen:*** support tools / methodologies to pave the way toward Technology Readiness Level TRL 7-8-9 (2022)
- ***Innovation Way: from wishful thinking to real-life applications*** (2023),
- ***Innovation: Mystery or a Systematic Approach?*** (2024)
- **Research and Innovation – Societal Impact** (2025)

Nobel Prize in Chemistry 2025

Susumu Kitagawa

“for the development of metal-organic frameworks”

Richard Robson

“for the development of metal-organic frameworks”

Omar M. Yaghi

“for the development of metal-organic frameworks”

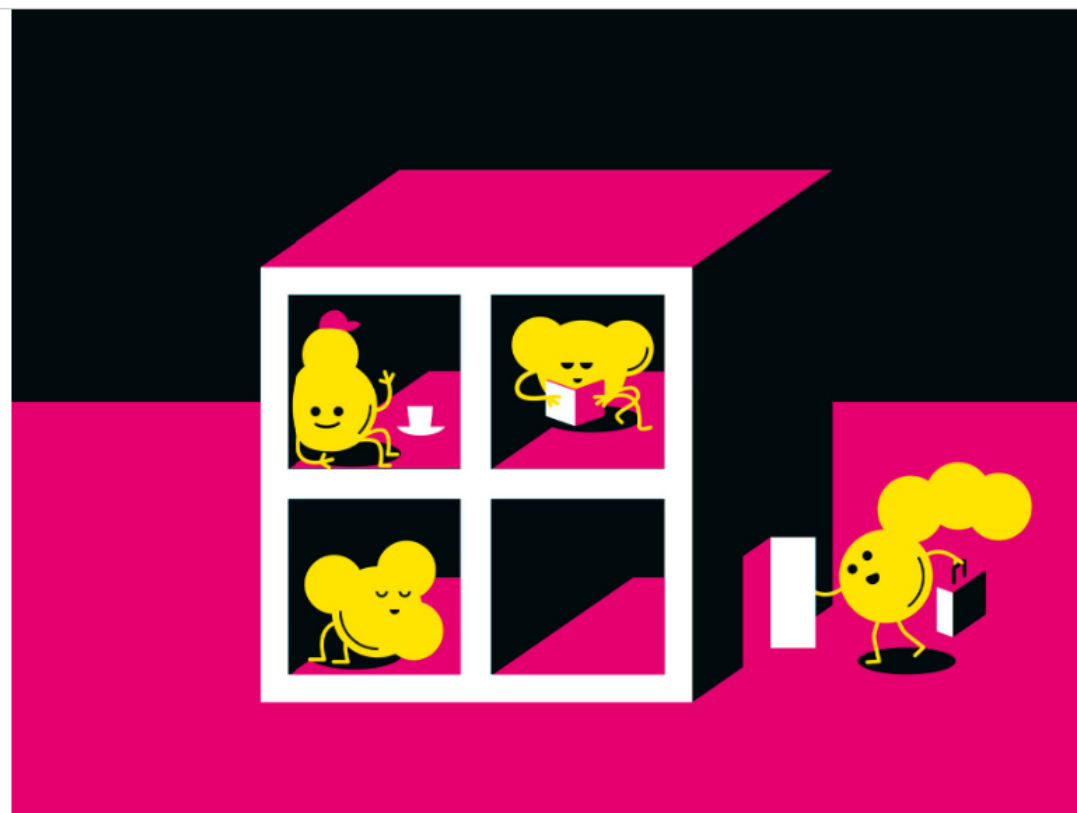
THE NOBEL PRIZE

[Nobel Prizes & laureates](#) [About](#) [Stories](#) [Educational](#) [Events & museums](#)

Their molecular architecture contains rooms for chemistry

The Nobel Prize laureates in chemistry 2025 have created molecular constructions with large spaces through which gases and other chemicals can flow. These constructions, metal–organic frameworks, can be used to harvest water from desert air, capture carbon dioxide, store toxic gases or catalyse chemical reactions.

Through the development of metal–organic frameworks, the laureates have provided chemists with new opportunities for solving some of the challenges we face.



Joel Mokyr

“for having identified the prerequisites for sustained growth through technological progress”

Philippe Aghion

“for the theory of sustained growth through creative destruction”

Peter Howitt

“for the theory of sustained growth through creative destruction”

THE NOBEL PRIZE

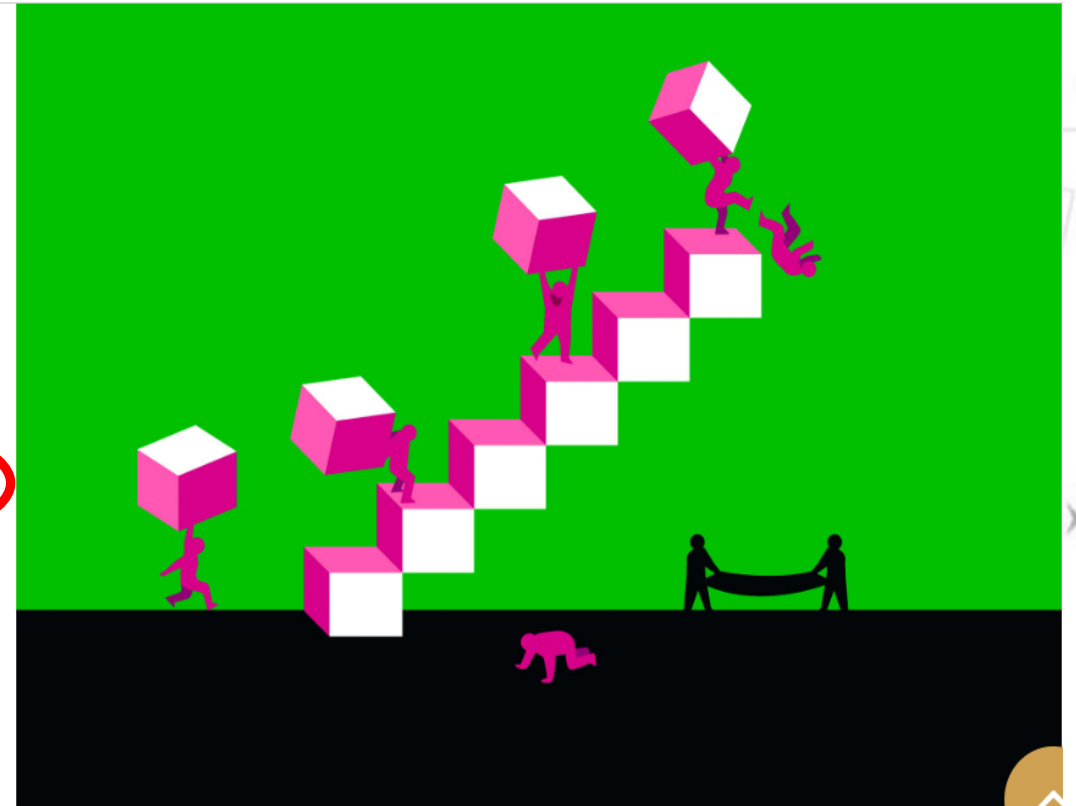
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They show how new technology can drive sustained growth

Over the last two centuries, for the first time in history, the world has seen sustained economic growth. This has lifted vast numbers of people out of poverty and laid the foundation of our prosperity. This year's laureates in economic sciences, Joel Mokyr, Philippe Aghion and Peter Howitt, explain how innovation provides the impetus for further progress.

The laureates have taught us that sustained growth cannot be taken for granted. Economic stagnation, not growth, has been the norm for most of human history. Their work shows that we must be aware of, and counteract, threats to continued growth.





Innovation “way”

the first occurrence of an idea for a **new product or process**

the first attempt to **carry it out into practice**

"bringing ideas to life":
innovation

new ideas:
invention*

Creativity



*patentable or not;

further implemented, it could generate a **new product or process**

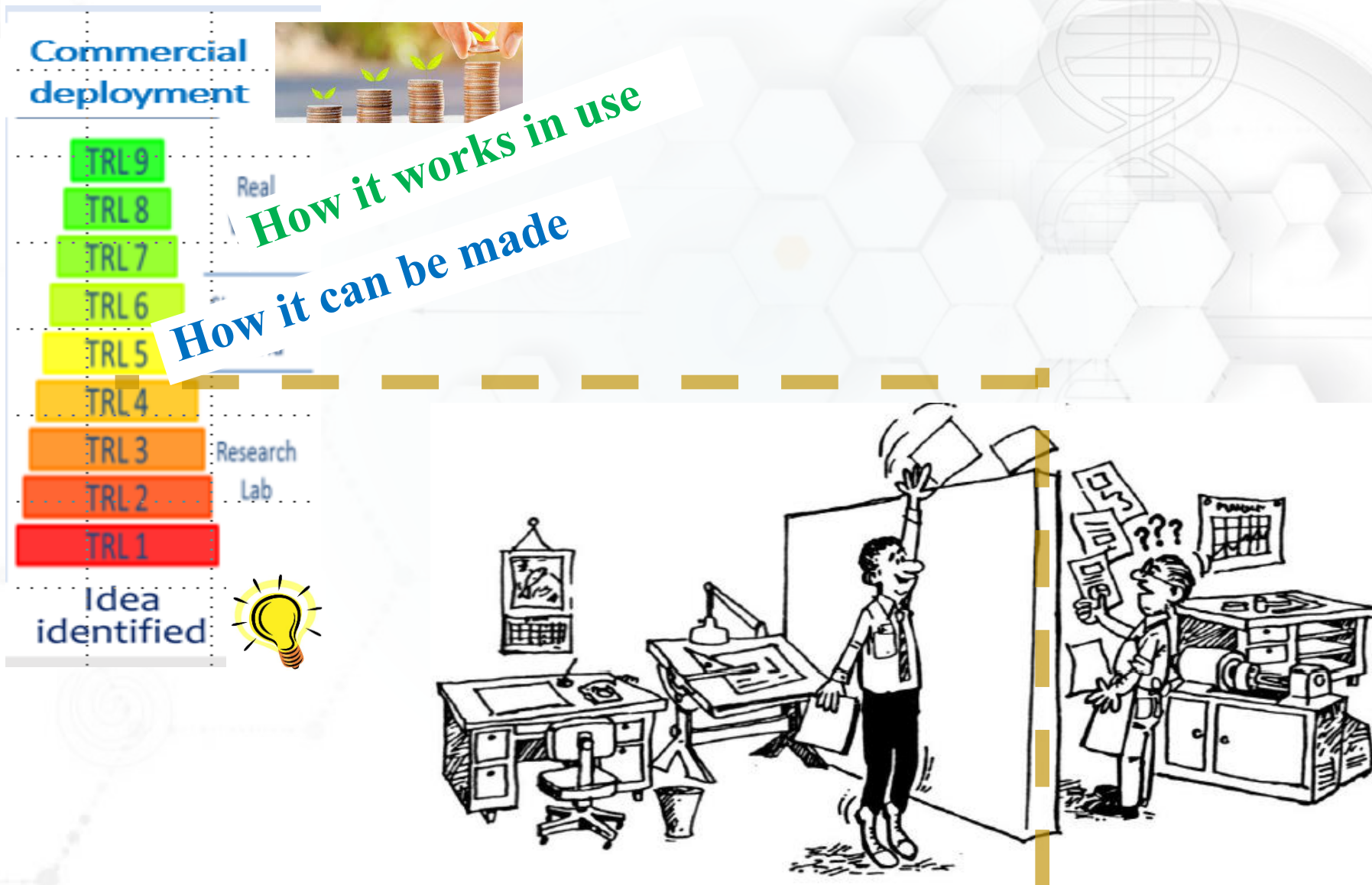
potentially innovative, able to become

an **innovation** when **successfully introduced** for the benefit of the society

Innovation is typically understood as the successful introduction of something *new and useful*, i.e. *it has effect in society*



Technology Readiness Level **TRL 4** wall



Innovation

Technology Transfer



**R&D
Lab**

**Inventions
potential
innovative**

**Movement of
knowledge and
discovery (that fulfill
the **three criteria*** of
TECHNOLOGY)
to ...**



Company



**Introduce
something
new and
useful that
has effect
in**



**Society
(market,
citizens)**

- 1.** systematic
- 2.** in a certain place
- 3.** directed for achieving a useful purpose



Let's proceed:

Research and Innovation – Societal Impact





Research & Innovation Solutions across various Societal Areas

AI

Software Imagination & Vision

S I M A V I

Software Imagination & Vision

Monica FLOREA

Head of Unit European Projects
Monica.Florea@simavi.ro

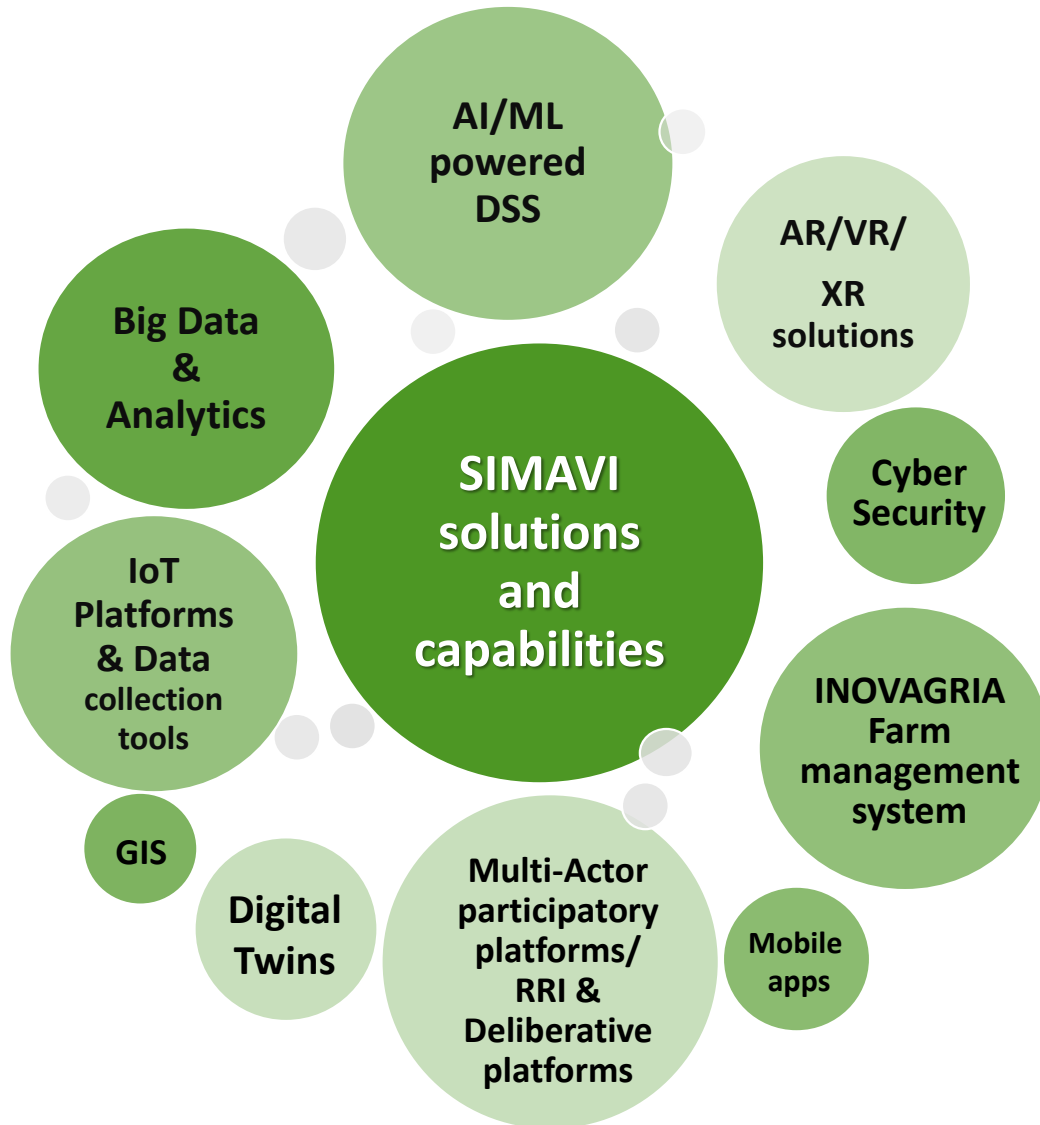
SIMAVI Business Card

+ 70**R&D projects
awarded****Horizon EUROPE
Horizon 2020****DEP EDF
ERASMUS+****ISF
ERA-Net****EUREKA
Eurostars**

**SIMAVI develops solutions for
various industries**

10 Projects Coordinated

Security**Environmental monitoring****eHealth****eGovernment****eLearning****eAgriculture****eTraining****Research & Development Projects****Enterprise Application Suite****Green Deal****Circular economy****Mobility & Smart cities****Energy****Industry 4.0****eCustoms****Customized Applications**



COMPETENCES

- ✓ **Platforms development, Integration and Interoperability**
- ✓ **AI/ML powered Software Tools, DSS and Analytics**
- ✓ **AR/VR/XR** development for awareness, immersive simulations for field-support and training
- ✓ **User-center design** (UX, UI, UJ)
- ✓ **Pilot deployment and implementation** in Eastern Europe, by engaging key partners:
 - Cities & Public Authorities
 - NGOs & Clusters & Research Centers
 - Farmers & farm associations
 - Industry 4.0
 - Energy DSO/TSO
 - Hospitals
 - LEAs & FRs
 - Ministry of Environment, Water and Forests
 - Ministry of Agriculture and Rural Development



SOLUTIONS & EXPERIENCE

- ✓ **ICT platforms** → WhiteGoods Platform, Automotive Platform and collaborative Private Cloud Platform
- ✓ **Data collection tool** from IoT & sensors
- ✓ **AI-based Decision Support System** for manufacturing
- ✓ **AI-Analytics Designer** targeted at sustainable consumption patterns
- ✓ **Digital Twins**
- ✓ **Analytics tool** – for process modelling, predictive downtime, failure, critical events
- ✓ **MaaS – Manufacturing as a Service**
- ✓ **Augmented Reality (AR)** based inspection and maintenance tool
- ✓ **Cybersecurity solutions** (data encryption, authentication, authorization)
- ✓ **Cloud to edge solutions**

REFERENCES:



[Coordinator SIMAVI]



ACCURATE – ‘Achieving Resilience Through Manufacturing as a Service, Digital Twins and Ecosystems’

- **SIMAVI Role:** Coordinator, ACCURATE requirements, integrated ecosystem, Decision Support and Federated MaaS Solution, and pilot implementation with Continental (RO)

OUR CORE OBJECTIVES



UNDERSTAND AND ADAPT
TO UNFORESEEN EVENTS



SWIFTLY ADJUST LOGISTICS
TO DIVERSE CONDITIONS



STRENGTHEN RESILIENCE
IN SMART MANUFACTURING



ELEVATE CIRCULARITY AND
SUSTAINABILITY



MAKE MAAS TECHNICALLY
AND ECONOMICALLY VIABLE



DRIVE DEEP INNOVATION
AND ACCELERATE ADOPTION

ACCURATE project enhances European manufacturing competitiveness by improving **sustainability, stability, resilience, and adaptability**. It develops **innovative approaches** and a **human-centric Decision Support System** to manage unforeseen events. ACCURATE ensures **timely services, flexible logistics, and production adaptation**, while creating a **trusted data space** for seamless stakeholder collaboration. It also promotes **Manufacturing as a Service (MaaS) solutions** through shared insights.

- **Use Cases:** *AIRBUS Atlantic (FR), TRONICO and Tame-Component (FR), Continental Automotive (RO).*

MATCHMAKER – ‘Open data and industry driven environment for multiphase and multiscale Materials Characterization and Modelling combining physics and data-based approaches’

- **SIMAVI Role:** MatCHMaker Framework Architecture and requirements, AI-based mechanisms for Materials Characterization, MatCHMaker Open Repository for knowledge and data sharing

USE CASES:

Construction



Low carbon cement

Decrease CO2 emission in the production

Maximum substitution of clinker with alternative materials with equal/superior performance

Energy



Solid Oxide Fuel/Electrolysis Cells (SOFC/SOEC)

Produce hydrogen without CO2 emissions and achieve the highest efficiency

Mobility



Proton-Exchange Membrane Fuel Cells (PEMFC)

Produce zero-emission power in multiple applications in transportation

The **MatCHMaker** project will enable the **integration and interoperability of complex characterisation and modelling (C&M) workflows** matching the needs of the EU manufacturing industry.

Requirements on **multiphase and multiscale materials** stemming from the **construction, energy and mobility sectors** will be translated into specific innovation challenges. An integrated approach will be used for establishing the **microscopic and macroscopic properties of advanced materials** that will reduce development costs, time and risks while improving sustainability.

➤ **Partnership with ASRO - Asociatia de standardizare din Romania.**

SOLUTIONS & EXPERIENCE

- ✓ **AI-based Decision Support Systems** dedicated to policymakers and communities
- ✓ **Smart City Digital Twins**
- ✓ **Data collection tool from IoT & sensors**
- ✓ **Citizen participatory platform / RRI platform**
- ✓ **Social Media Data Acquisition Engine**
- ✓ **AI-powered credit risk assessment and factoring indicators**
- ✓ **Mobile Application** for citizens engagement
- ✓ **Augmented & Virtual Reality**
- ✓ **Interactive & educational games** development, serious games & gamification
- ✓ **ICT Framework** for water ecosystems

REFERENCES:



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Projects



ITHACA
All To Enhance Civic Participation



ACAB



NAIADES – ‘A holistic water ecosystem for digitization of urban water sector’

- **SIMAVI Role:** NAIADDES ICT framework integration & communication platform, pilot implementation and evaluation with Dunărea Brăila Public Utilities Company (RO)



- Water consumption & efficiency
- Confidence of water consumers
- Safety & reliability
- Personalized persuasive feedback and services

NAIADES aims to **modernize and digitize** the water sector by providing a **holistic ICT framework for efficient water ecosystem management**, integrating **innovative tools**:

- **optimization of water consumption** and **smart water operation scheduling** tool;
- **personalized water behavioral change support** mobile application, which will aim to enhance **public awareness** on **water consumption** and **usage savings**;
- **water demand prediction Toolkit** which will predict the **water demand**, save **water resources**, reduce **operation and energy costs** and **greenhouse gases**.

Pilot demonstrations in **3 areas: Alicante (Spain), Brăila (Romania) and Ville de Carouge(Switzerland)**.

PANTHEON – ‘Community-Based Smart City Digital Twin Platform for Optimised DRM operations and Enhanced Community Disaster Resilience’

- **SIMAVI Role:** Smart City Digital Twin (SCDT) platform, AI-based modelling & self-adaptive simulations, Integration & testing of PANTHEON platform



PANTHEON focuses on developing a **Community-based Digital Ecosystem for Disaster Resilience** utilising **Smart City Digital Twin (SCDT) technology** and other emerging innovations to advance the existing risk assessment methods, mitigate potential vulnerabilities and build a strong community disaster resilience foundation:

- ***PANTHEON Disaster - Resilient Communities Model***
- ***Smart City Digital Twin (SCDT) for Community Disaster Risk Management (DRM)***
- ***Decentralised and Participatory Governance & Tools***
- ***Intelligence, CM-SCDT Processes and Optimal Disaster Risk Management Operations***
- ***Data Delivery Scheme and Remote Sensing for Community-based SCDT***
- ***Interactive User Interface for a Holistic Simulation Environment & Synthetic Environment***

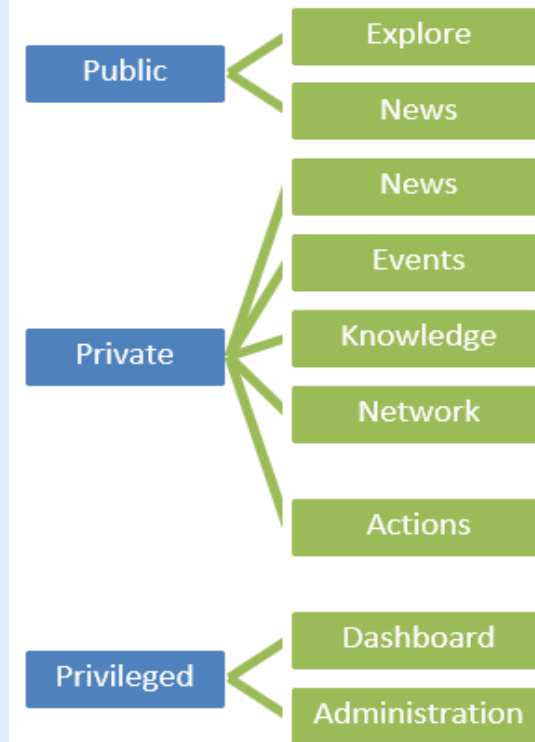
LIVING INNOVATION – ‘Implementing RRI through co-creation of smart futures with industry and citizens’

- **SIMAVI Role:** Development & Implementation of the Virtual Community Platform



In the **LIV:IN project**, major industry leaders join forces to co-create more **responsible approaches to innovation** building on the premise that **recognition of the value of RRI among industry** is necessary for achieving the aim of the call “to progress further in integrating RRI in industrial contexts”.

Its **Virtual Community Platform (VCP)** tackles challenges of **virtual communities** by incentivizing **collaboration**, fostering **content co-creation**, showcasing **use cases**, and accumulating **credits** based on **content creation** and **user interactions**.



SOLUTIONS & EXPERIENCE

Environmental monitoring

- ✓ GIS
- ✓ ICT Toolkit for simulating and assessing the impacts and risks of climate change
- ✓ Toolbox for Decision Support and adaptive control of air quality monitoring, Soil Pollution monitoring

Forest and Ecosystem Management

- ✓ AI based DSS for optimizing forest management decisions for a low-carbon, climate resilient future in Europe
- ✓ Platform for efficient resource utilization and prevention against global wildfire threats
- ✓ Authoring tool with AR/VR content curation

Urban Safety and Management

- ✓ Integrated toolkit for intelligent management of processes, ethics and technology for Urban Safety
- ✓ ICT framework for flood environmental emergency & awareness

REFERENCES:

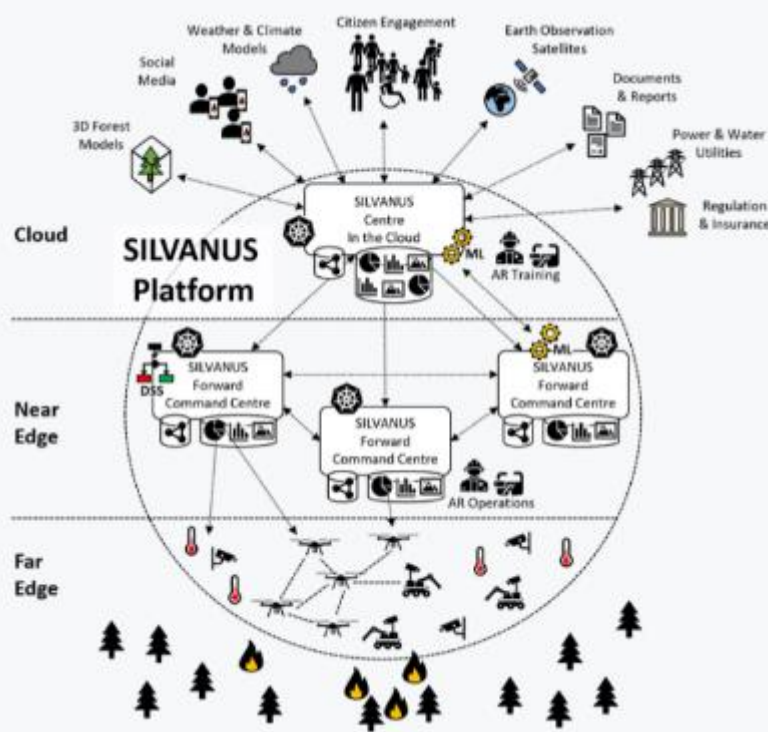


[Coordinator SIMAVI]



SILVANUS - 'Integrated Technological and Information Platform for Wildfire Management'

- **SIMAVI Role:** Authoring tool with AR/VR content curation for training firefighters, Forest fire ignition models, Pilot deployment and implementation in Romania (Rodna Mountains National Park)



SILVANUS platform will cater to the demands of **efficient resource utilization** and **provide protection against threats of wildfires** encountered globally. **SILVANUS** will establish synergies between **environmental, technology and social science** experts for enhancing the ability of regional and national authorities to monitor forest resources, evaluate biodiversity, generate more accurate fire risk indicators and promote safety regulations.

The novelty of **SILVANUS** lies in the development and integration of **advanced semantic technologies** to systematically formalise **the knowledge of forest administration and resource utilization**. The project innovation are validated through **11 pilot demonstrations across Europe and internationally**.



TREEADS - 'A Holistic Fire Management Ecosystem for Prevention, Detection and Restoration of Environmental Disasters'

- **SIMAVI Role:** Integrated Fire Management systems, practices and services, Virtual Reality simulators, pilot deployment and implementation in Romania (Macinului Mountains National Park)



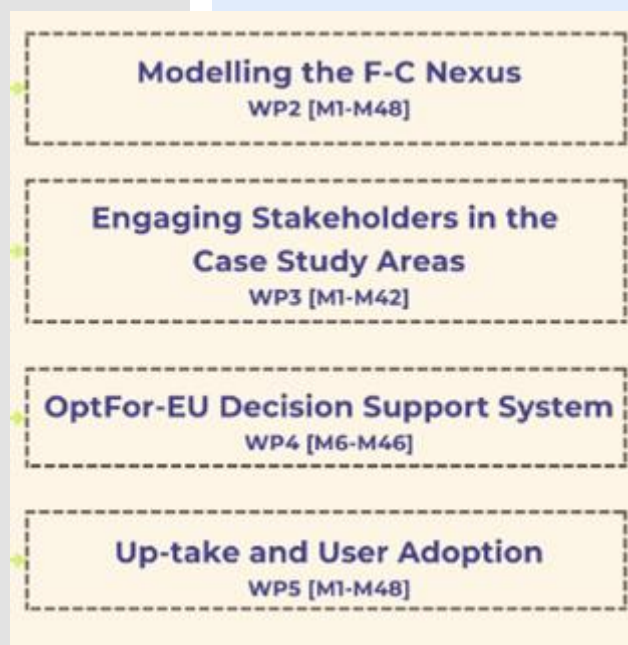
TREEADS proposes the use of a **real-time risk evaluation tool** that can receive multiple classification inputs. To create a model of **Fire adapted communities (FAC)** in parallel to insurance incentives, **TREEADS** will use **alkali activated construction materials (AAM) integrating post-wildfires wood ashes (PWA) for fire-resilient buildings and infrastructure**. Uses a variety of technological solutions such as: the Copernicus infrastructure, drones customized for accurate forest supervision, VR for training, wearables for the protective equipment, UAG and airships;

Will be demonstrated and validated under real operating conditions that will involve **8 complex pilot implementations executed in 7 EU countries and in Taiwan**.



Opt4EU - 'OPTimising FOReSt management decisions for a low-carbon, climate resilient future in Europe'

- **SIMAVI Role:** OptFor-EU Decision Support System, architecture and technical specifications, DSS backbone framework and ML based scenarios, pilot implementation & deployment in Romania.



The **OptFor-EU** project is developing a **Decision Support System (DSS)** to help **forest managers** and stakeholders **optimize decarbonisation strategies** and enhance **Forest Ecosystem Services (FES)** across Europe.

Leveraging **digital technologies**, the DSS integrates:

- **BigData & existing datasets;**
- **Novel essential forest mitigation indicators;**
- **Climate & forest response modelling;**
- **AI-driven decision-making tools.**

For the **8 case study areas**, the DSS will provide a **ready-to-use digital solution** to support **climate-resilient forest management**, ensuring **sustainability, business adoption, and societal impact**.

NEVERMORE - 'New Enabling Visions and tools for End-useRs and stakeholders thanks to a common MOdeling fRamework towards a climatE neutral and resilient society'

- **SIMAVI Role:** ICT Toolkit design, development and deployment, pilot implementation in Romania for wetland in Danube Delta Region.

The **NEVERMORE** project advances **integrated models** and **interactive digital tools** to assess **climate change risks** and enhance **mitigation and adaptation policies**. It fosters dynamic collaboration among **public and private stakeholders** through **local and transnational councils**, driving **co-design, innovation, and impactful policy-making**.

It focuses on **5 case studies**, including **climate change hot-spots** such as an islands, the **Boreal, Mediterranean and Alpine regions**:

- Island – Sitia, Crete island (EL);
- Mountain region – Trentino region (IT);
- Boreal region – Norrbotten County (SE);
- Mediterranean region – Murcia region (ES)
- Wetland – Danube Delta (RO).



SOLUTIONS & EXPERIENCE

- ✓ **INOVAGRIA farm management system** created for managing the activity of agricultural, vegetable or animal farm
- ✓ **AI-based Decision Support Systems (DSS)** on crop management, pest control, and irrigation
- ✓ **Community participatory platforms/ RRI platforms**
- ✓ **Geographic Information Systems (GIS)** for mapping and spatial analysis
- ✓ **Interactive Dashboards** to provide real-time visualizations of key indicators, helping stakeholders make informed decisions
- ✓ **Digital Twin**
- ✓ **IoT platforms** and **real-time data collection** from **IoT sensors**
- ✓ **Mobile apps**
- ✓ Data driven **AR/VR/XR** immersive simulations

REFERENCES:



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Projects



Beneficiary: Payment and Intervention Agency for Agriculture

Integrated Administration and Control System (IACS)

Figures and Facts:

The system ensures consistency and compatibility between national schemes for farmers, covering:

- 944 076 unique applications submitted for a yearly campaign
- 34,55 million agricultural physical blocks, for all schemes required
- 1,45 million farmers in the database
- Over 13,4 billion EUR paid
- Over 83 million operations performed in the APIA's information system

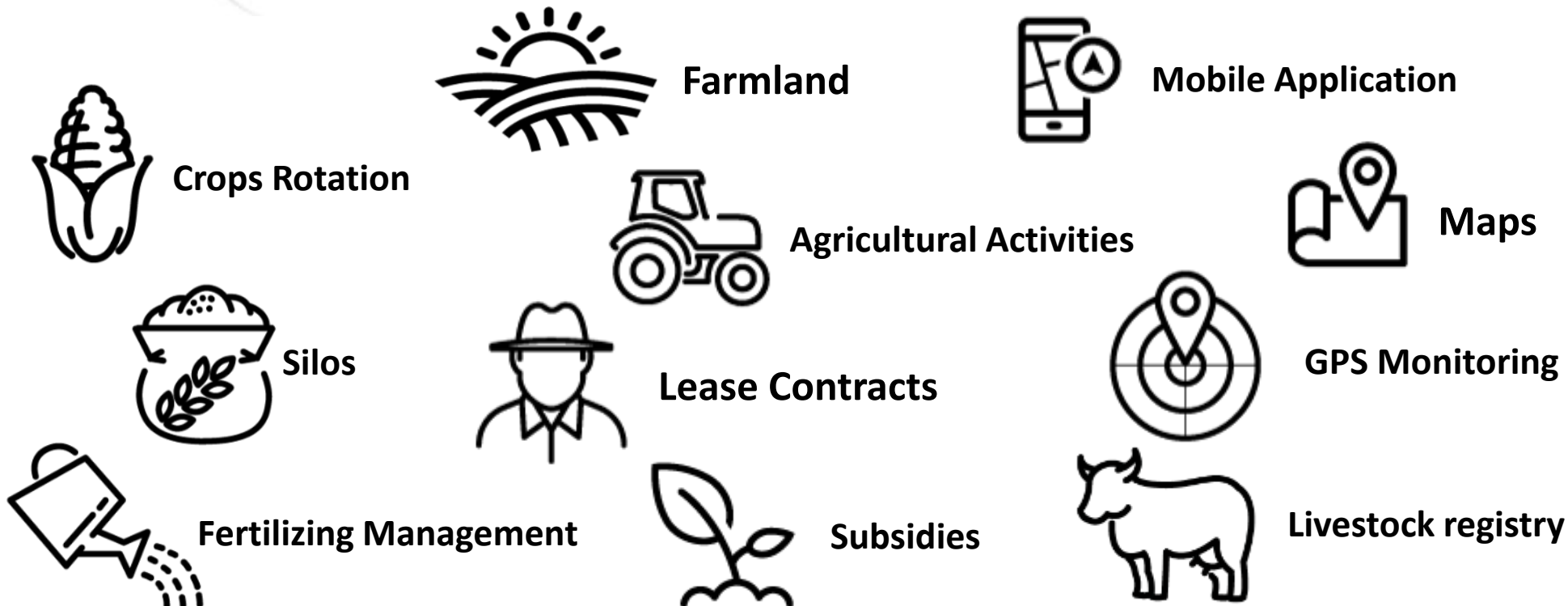
Organizational structure:

- 42 county centres
- 5,000 internal users
- +900,000 beneficiaries



Simple, intuitive and user friendly
Integrated farm management software

COMPONENTS:



SOLUTIONS & EXPERIENCE

✓ **IoT Platform development & Data integration from IoT sensors**

✓ **EIIS (Energy Integrated Information System)** application

✓ **Predictive Analytics** Tool to anticipate downtime, failure, critical events

✓ **Software Architecture** for small and medium distribution system operators (DSOs)

✓ **Integrated Smart GRID Cross-Functional Solutions**

✓ **Cybersecurity domain solutions** (vulnerability assessment, threat detection, risk mitigation):

- Heatmaps to represent vulnerable components or malware/intrusion activity
- Dashboard and Attack Graphs displaying how an intruder can traverse a network of nodes through vulnerabilities
- Dark Web Monitoring tool (MT) for potential threats
- SIEM (System Information Event Management) for collecting and analyzing security event data

REFERENCES:



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[Coordinator SIMAVI]



DEM₄PED



FlexiGrid – ‘Interoperable solutions for implementing holistic FLEXibility services in the distribution GRID’

- **SIMAVI Role:** FlexiGrid system architecture, development of cross-functional platform integration, security access control and communication services



The **FLEXIGRID** project develops solutions to ensure the **security and reliability** of electricity grids as **renewable energy** integration grows. It provides an **enabling architecture** for **small and medium DSOs** to unlock **flexibility resources**, offering **IoT, peer-to-peer and peer-to-pool marketplaces, vehicle-to-grid, power-to-heat, and power-to-gas** solutions, along with **innovative business models**.

By enabling **cross-sector integration, resource optimization, and demand response**—including **EV charging schemes and storage**—DSOs can address **capacity shortages** while upgrading aging systems with **smart technology**.

- ***8 use cases will be demonstrated in 4 countries (Sweden, Bulgaria, Turkey, Switzerland) - the demonstration sites will be operated by 3 DSOs and 2 large companies.***

InterPED – ‘INTEROperable cloud-based solution for cross-vector planning and management of Positive Energy Districts’

- **SIMAVI Role:** InterPED architecture, cybersecurity measures, and platform system integration; user visualization tools and piloting activities with Alba Iulia College District (RO)

GOALS:

- Improved integration of energy (e.g. distributed renewable energy generation, waste heat utilisation, storage) and non-energy sectors (e.g. mobility) within Positive Energy Districts (PEDs).
- Increased participation of consumers and energy communities in the value chain of the energy system.
- Increased availability of tools, guides and interoperable solutions for planning, design, development and management of Positive Energy Districts (PEDs).
- Improved integration of PEDs in energy systems, improved contribution of PEDs to energy grid robustness with regard to dependencies to energy supplies.

InterPED aims to enable the concept of **PEDs via sector coupling, cross-vector integration, demand flexibility and consumer engagement**, while improving utilisation of local RES, storage and excess/waste heat (E/WH) sources. InterPED will deliver a **scalable and adaptable cloud-based platform** composed of **analytical, modelling and optimization services for planning, supervision and control of integrated PEDs** (including power, heating and cooling, mobility).

- *Demonstrated at 4 pilot sites in: Lugaritz-Matía Community (San Sebastián, Spain); Ecovillage Findhorn (Scotland), Arena Innovation Community (Switzerland) and Alba Iulia College District (Romania).*

iDriving – ‘Intelligent & Digital Roadway Infrastructure for Vehicles Integrated with Next-Gen Technologies’

- **SIMAVI Role:** Mobile and in-vehicle applications for early warnings, Digital Twin-Based Control Center with XR features, pilot implementation with Municipality of Alba Iulia (RO)



iDriving project focuses on enhancing **road safety** through **intelligent, data-driven solutions** for urban and secondary roads across Europe. Leveraging advanced technologies like **AI, digital twins, and real-time monitoring**, iDriving aims to provide comprehensive **safety and traffic management** by detecting road hazards, optimizing infrastructure maintenance, and enabling efficient vehicle-to-infrastructure communication.

Key Goals:

- Safety Criteria Catalogue (SCC);
- Enhanced V2I Communication;
- Real-Time Monitoring and Hazard Detection;
- Digital Twin for Predictive Maintenance;
- User Training and System Validation;
- Open Science and Data Sharing.

➤ *Scenarios in 6 unique pilot sites in Austria, France, Spain, Croatia, Romania, and Greece.*



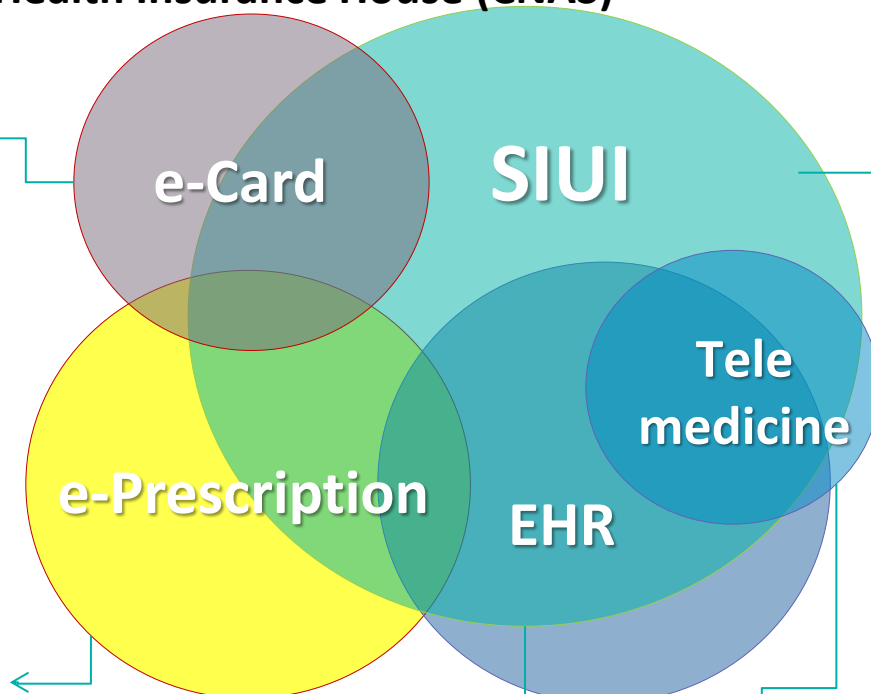
Integrated Health Information System in Romania – SIUI

Beneficiary: National Health Insurance House (CNAS)

15,5 millions
persons registered
with cards



- 150+ millions prescriptions registered in 3 years;
- 16,000 prescriptions daily.



Completed in
Dec. 2015

- over 6,000 Family Doctors
- over 1,000 hospital users
- 8.6 millions personal files

Covers all population of Romania

- all Health Insurance County Houses
- **62,968** doctors
- **14,812** family doctors
- **111,783** nurses
- **5,799** clinical services providers
- **2,672** laboratory services providers
- **893** home care providers
- **1,126** providers of ambulatory recovery services
- **802** hospital services providers
- **179** ambulance services providers
- **302** suppliers of medical devices
- **5,398** providers of pharmaceutical services
- **6,799** dental care providers

SOLUTIONS & EXPERIENCE

Healthcare and Patient Support

- ✓ Tele-monitoring & Tele-rehabilitation applications
- ✓ Integrated and interactive Patient Care Ecosystem that supports quality of life for elderly people
- ✓ Monitoring solution for patients with neurodegenerative diseases
- ✓ Serious Games for brain training
- ✓ AR/VR for rehabilitation support

Advanced Technology Solutions

- ✓ Decision Support Tool for monitoring and controlling of air quality
- ✓ AI based DSS to foster evidence-based pain relief methods for cancer patients
- ✓ Multi-source real-world clinical information access and integration framework
- ✓ ML Anomaly Detection Component and NLP services
- ✓ Virtual Assistant and Application for Patient' Treatment Journey dedicated for healthcare professionals and carers use
- ✓ Diagnostic Support Tool to assist healthcare professionals

REFERENCES:



[Coordinator
SIMAVI]



SOLUTIONS & EXPERIENCE

Security Infrastructures and Frameworks

- ✓ Real-time Early Detection and Alerting Framework for Operation Control Systems
- ✓ Operational Cybersecurity Risk Management Platform
- ✓ Big Data Integration Platform with real-time alerts
- ✓ Physical threat response Optimization (PTRO) tool
- ✓ Data Fusion Tool for multi-source comprehensive data view
- ✓ Analytics for real-time border event alerts

Data Acquisition, Analysis, and Visualization

- ✓ Social Media Data Acquisition Engine
- ✓ Multimedia Analysis for Crime prevention and Investigation
- ✓ Mobile apps monitoring or for on Field Guidance
- ✓ AI/ML-powered Prediction & Visual Intelligence
- ✓ Stream data collector
- ✓ Biometric data integration & analysis

Training and Skill Development

- ✓ XR Training dedicated to LEAs, First Responders and Cybersecurity experts

REFERENCES:



ODYSSEUS
[Coordinator SIMAVI]



[Coordinator SIMAVI]



REDALERT

[Coordinator SIMAVI]



[Coordinator SIMAVI]



SOLUTIONS & EXPERIENCE

- ✓ Adapting technologies from civil applications or addressing hybrid warfare
- ✓ Measurement and monitoring of physiological and cognitive state of soldiers
- ✓ AR/VR/XR
- ✓ Collection and sharing of **sensor data**
- ✓ **User interfaces** to help users and in particular pilots to understand and anticipate the **system behaviour**
- ✓ **Common simulation framework for wargames/combat simulations** with the potential to facilitate reinforcement learning for mission planning and execution support
- ✓ **Computer-based decision support system that leverages AI, machine learning, wargames/combat simulations and digital twins of the battlespace**

REFERENCES:



FEDERATES -
FEDeratedEcosystem of
euROpean simulation Assets
for Training and decision
Support

FEDERATES project has the objective of building the first prototype of a **European MSaaS (Modelling & Simulation as a Service) Ecosystem, to support decision making and training of European Armed Forces.** The project, led by Rheinmetall Electronics, is a multinational activity funded by the EU Commission, with the support of **15 European Nations.**

SOLUTIONS & EXPERIENCE

- ✓ Augmented cultural heritage inclusion and accessibility
- ✓ **One-stop-shop** and open marketplace for **XR applications** as support for learning, training and education
- ✓ Context-Aware **AR content** for combining digital information with the physical world
- ✓ **Authoring Tools** to create, design, and produce digital content
- ✓ Interactive & **Educational games** development
- ✓ Complex **Virtual Laboratories** with 3D immersive
- ✓ eLearning platform dedicated to Training & Awareness
- ✓ Single API interface to interact with **different VR devices**
- ✓ Deployment across **multiple mobile and wearable AR/VR devices**

REFERENCES:



Click on
Projects



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Complete portfolio of digital solutions for learning and development, providing our clients with a wide spectrum of solutions, from traditional to cutting edge:



eLearning Courses

We create online courses, 30 to 90 minutes long, that can deliver the required knowledge and skills on any topic



Microlearning

Designed for on-demand learning, microlearning videos are designed to provide employees with support at the point of need



Video Learning

Designed to engage any learner, video courses are the most efficient way to deliver knowledge to the target audience



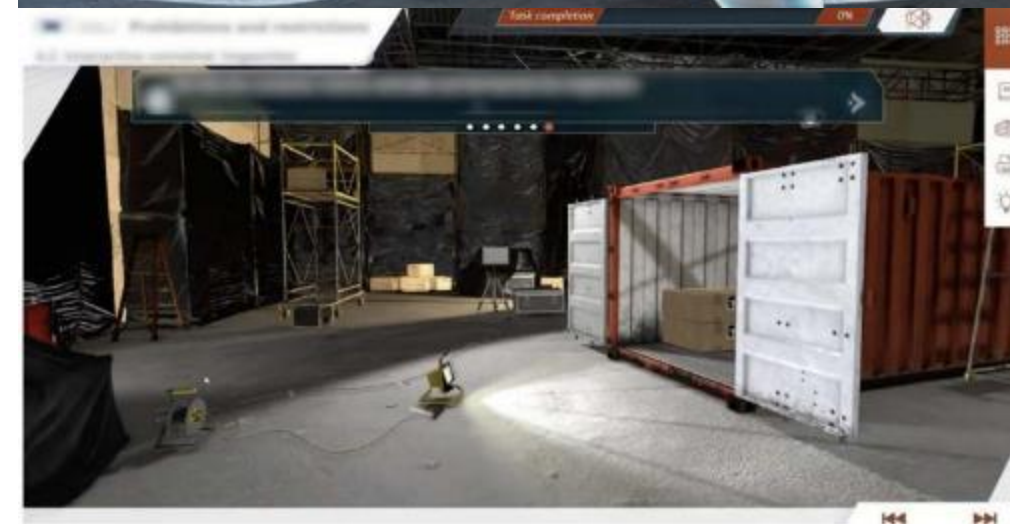
LMS

We provide installations and customizations of open-source Learning Management Systems, such as Moodle or Totara



Consultancy

We provide extended consultancy on learning and development, from L&D strategy, analysis, impact or creating competency frameworks



eLearning & eTraining



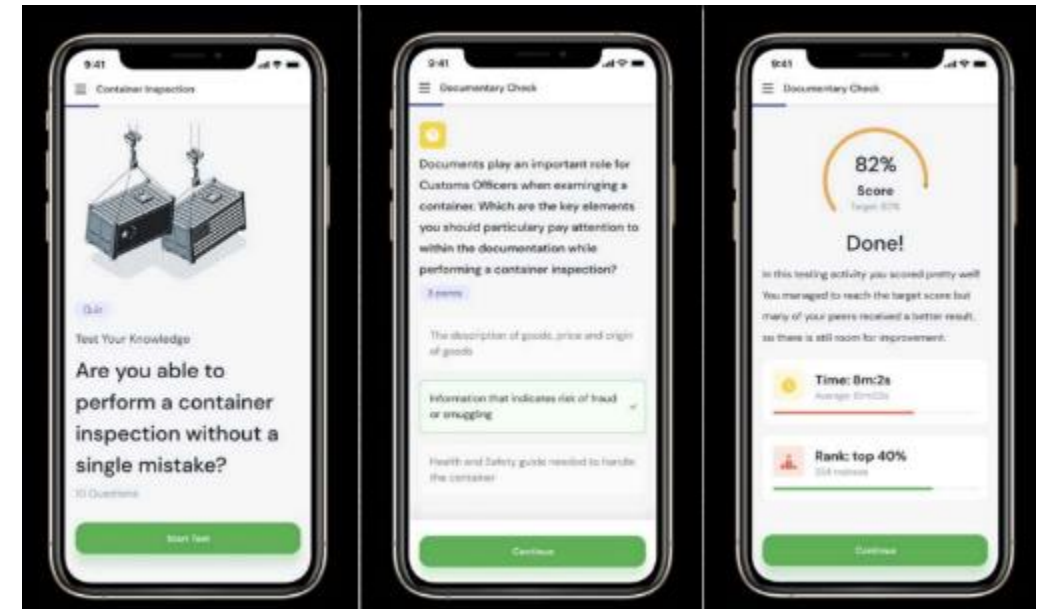
Mobile Learning

We create mobile learning applications designed to support learners with knowledge support at the point of need

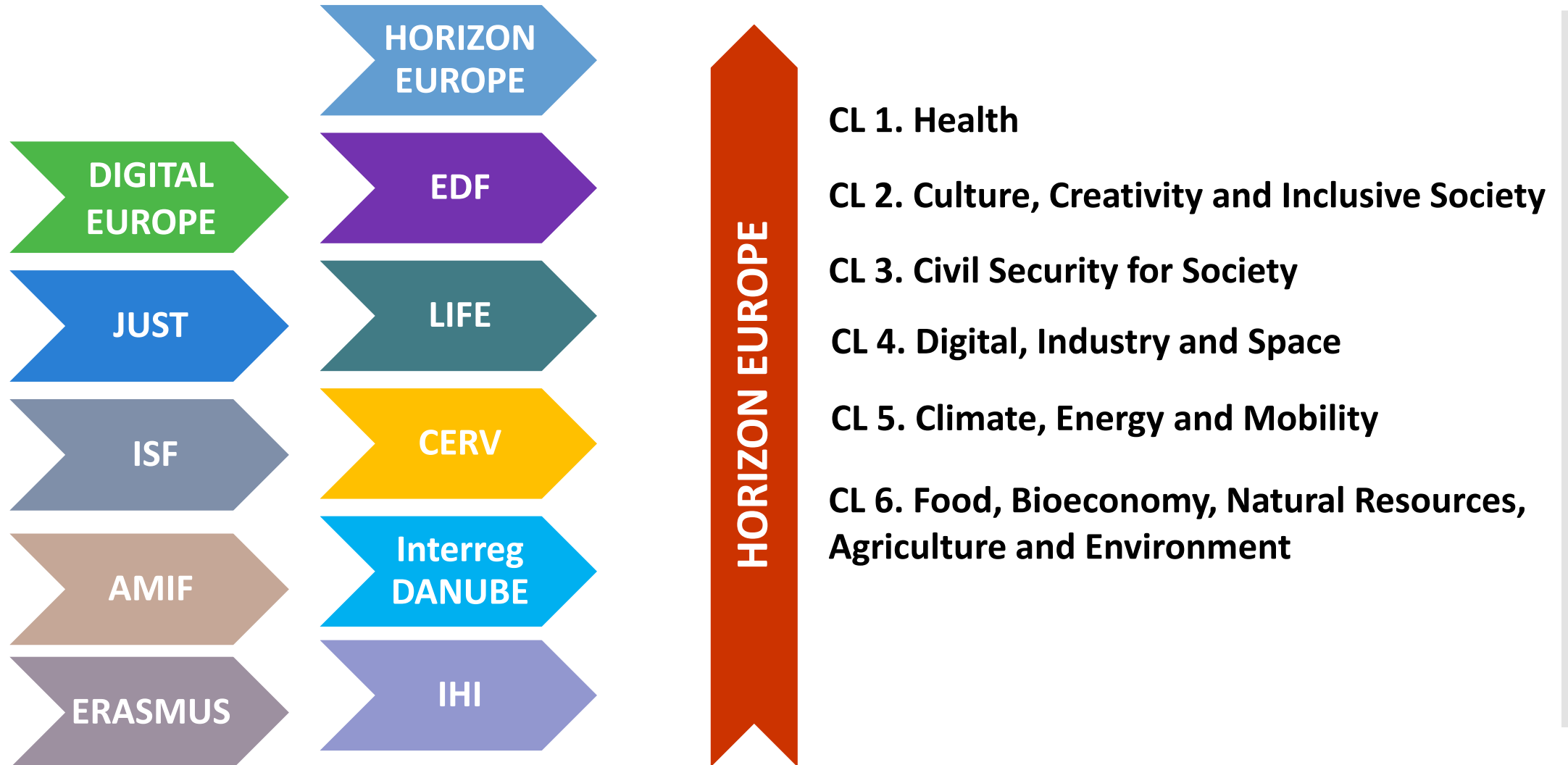


AR/VR

We create customized Augmented Reality/ Virtual Reality applications that can emulate any technical environment for training



EU R&D Programs of interest



European Affiliations



CyberEPES CLuster



Thank you!

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<https://www.simavi.ro/en/rd-projects>



International Symposium PRIOCHEM 2025 – “Priorities of Chemistry for a Sustainable Development”

Workshop: Partnerships, Synergies and Tools for Innovation and Development

Round Table: Research and Innovation – Societal Impact

**Research and Innovation: Societal Impact through
Defence and Space**

Florin-Adrian Popescu

INSTITUTE OF SPACE SCIENCE - subsidiary INFLPR, **Măgurele, Romania**

1. A general regard:

- Research and Innovation are the twin engines of human advancement.
- R&D is often viewed through the lens of technical progress or economic competitiveness.
- **BUT** : R&D value lies in **Societal Impact** : how discoveries improve lives, enhance security, and strengthen collective resilience.

Historically:

Defence and Space domains have served as **incubators** for high-risk, high-reward technologies that eventually find widespread **civilian applications**. The trajectory from fundamental research to practical benefit, which is often termed the “**innovation spillover**” effect, continues to shape the industries and the societies worldwide.

2. The Dual-Use Legacy of Defence Research

The **Global Positioning System (GPS)**, originally developed by the U.S. Department of Defense for military navigation, now underpins global logistics, precision agriculture, telecommunications, and financial systems. Its societal impact is immeasurable — enabling real-time navigation, emergency response coordination, and scientific monitoring of tectonic motion and climate-related changes.



Similarly, **radar technology**, once used primarily for aircraft detection, has evolved into a cornerstone of meteorology and transportation safety. Advanced radar systems now monitor weather patterns, track storms, and contribute to early warning systems that save lives during natural disasters.

Defence R&D has accelerated progress in **materials science**, **artificial intelligence (AI)**, and **autonomous systems**. Lightweight composite materials, initially designed for **military aircraft**, have been adopted in **civil aviation** and the automotive industry to improve energy efficiency and reduce emissions.

AI-based image recognition : first developed for **target identification** — is now integral to **medical imaging**, assisting radiologists in detecting early-stage diseases with remarkable precision.

Cybersecurity: techniques created to secure military communication networks now protect civilian data, e-commerce platforms, and critical infrastructure against cyber threats.

3. Space Research as a Catalyst for Global Advancement

Satellite Earth observation has become indispensable for weather forecasting, agriculture, and disaster management. **High-resolution imagery** supports precision farming, allowing farmers to optimize water and fertilizer use, while **global monitoring systems** track deforestation, ice melt, and ocean health. During **natural disasters** such as floods or wildfires, satellite data provide rapid situational awareness, enabling effective humanitarian response.



Space technology transfer. Many everyday products and systems trace their origins to space programs.

Memory foam, developed by NASA for spacecraft safety, is now a standard in consumer bedding and protective equipment.

Water purification systems, engineered for long-duration missions, are used globally to provide clean drinking water in developing regions and during emergencies.

Modern **miniaturized sensors**, originally designed for satellites and landers, now power medical imaging devices and environmental monitors.

International collaborations such as the **James Webb Space Telescope** and the upcoming **Laser Interferometer Space Antenna (LISA)** exemplify how shared scientific goals foster cooperation among nations.

4. The Convergence of Defence and Space Research

Dual-use technologies : serving both security and societal purposes — define the modern research landscape.

Satellite constellations developed for secure communication and navigation are also providing global broadband access, connecting remote regions and enabling education and healthcare in underserved communities.

Quantum sensing and communication, initially researched for navigation and encryption, promise future breakthroughs in medical diagnostics and underground resource mapping.

Miniaturization of spacecraft and sensor systems, combined with advances in AI and data analytics, is creating opportunities for global-scale environmental monitoring and sustainable resource management.

These **converging technologies** form the backbone of **resilient societies**, capable of anticipating crises, protecting populations, and driving sustainable economic growth.

5. An overview of Ethical Responsibility and Global Collaboration

Dual-use technologies carry **inherent risks** if applied without **ethical oversight**.

Responsible R&D requires **transparency, governance, and inclusivity**. **Ethical** frameworks must guide developments in artificial intelligence, autonomous systems, and surveillance technologies to **prevent misuse** and to align progress with **human rights** and **sustainability** principles.

Collaboration across governments, academia, industry, and civil society is essential for **solving global challenges**. Initiatives such as **Horizon Europe**, **DARPA**'s open innovation programs, and **ESA–NASA** partnerships demonstrate how shared research infrastructure and data can **amplify societal impact**.

6. A brief conclusion

Research gives us **understanding**, **Innovation** gives us **capability**, but it is **our shared values** that give them **meaning**. Together, they define the pathway toward a **safer, fairer**, and more **resilient future**.

Thank you for you patience

References

National Research Council. (2012). *Continuing Innovation in Information Technology*. The National Academies Press.

NASA Technology Transfer Program, <https://technology.nasa.gov/>

European Space Agency (ESA). *LISA Mission Overview*, <https://www.cosmos.esa.int/web/lisa>

European Commission. *Horizon Europe Strategic Plan 2025–2027*.

DARPA. *Defense Advanced Research Projects Agency – Innovation Framework*, <https://www.darpa.mil/>



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Research and Innovation – Societal Impact

Prof. Dr. Ing. Cornel Cobianu

eBio-hub Excellence Center of
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Outline

1977-1989

1990-2003

2003-2017

2017-2025

Contributions to Romanian Microelectronic Technology. Technology transferred to "IPRS Baneasa" and "Microelectronica Bucharest"University of Twente & Philips

Contribution to the foundation of Center of Microtechnology Bucharest !



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REFERENCES

1. J. Gallup and A. G. F. Durwall, *Am. Ceram. Soc. Bull.*, **36**, 47 (1957).
2. R. C. Buchanan and M. A. Zuegel, *J. Am. Ceram. Soc.*, **71**, 26 (1988).
3. R. F. Geller and E. N. Bunting, *J. Res. Nat. Bur. Stand.*, **23**, 275 (1939).
4. D. W. Johnson and F. A. Hummel, *J. Am. Ceram. Soc.*, **51**, 196 (1968).
5. N. M. Pavlushkin and A. K. Zhuravlev, *Izv. Akad. Nauk, SSSR, Neorg. Mater.*, **5**, 572 (1969).
6. P. W. McMillan, "Glass Ceramics," 2nd Printing, Academic Press, London (1969).
7. H. K. Embabi, M. N. Alaya, and A. E. Mahoyoub, *Trans. J. Br. Ceram. Soc.*, **73**, 20 (1974).
8. J. D. Schnapp, A. Petzold, H. Busch, and H. Elfer, *Silikatech*, **26**, 219 (1975).
9. J. Ito, *The Am. Mineralogist*, **53**, Jan.-Feb. (1968).
10. S. English, *J. Soc. Glass Tech.*, **8**, 205 (1924).
11. S. B. Kim, M.S. Thesis, University of Illinois (1977).

A Theoretical Study of the Low-Temperature Chemical Vapor Deposition of SiO₂ Films

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Microelectronica, R-72996, Bucharest, Romania

ABSTRACT

The silicon dioxide deposition on silicon substrates in the SiH₄-O₂-N₂ system was investigated in the temperature range from 80° to 400°C on a nozzle-type reactor at atmospheric pressure. An exponential temperature dependence (of Arrhenius type) with a break at 250°C has been observed for the O₂/SiH₄ ratio corresponding to the maximum deposition rate and also for the O₂/SiH₄ ratio corresponding to near-zero deposition rate in the retardation region. Within the bimolecular surface reaction theory (Langmuir-Hinshelwood mechanism), these results are explained, and the break is interpreted as a change in the adsorption mechanism of the reactant gases with temperature. The apparent activation energy of the surface reaction (5.2-6.5 kcal/mol) in the temperature range from 80° to 400°C has been derived from the Arrhenius plot of the maximum deposition rate, in agreement with the above theory. An empirical reaction rate equation has been proposed which, in addition, explains the linear dependence of the maximum deposition rate on silane flow rate at constant O₂/SiH₄ ratio.

The study of the low-temperature silane oxidation has been made in two directions: homogeneous and heterogeneous reactions.

The homogeneous reaction between oxygen and silane was studied by Emelius and Stewart (1), who found the lower and upper limits of the explosion in the temperature range from 15° to 200°C. They concluded that the gas-phase oxidation of the silane is a branching chain reaction. Strater (2) studied the formation of silicon dioxide in the gas-phase or on the reactor walls for SiH₄-O₂-N₂ mixtures. He observed that the temperature of reaction initiation increased with O₂/SiH₄ increase. For temperatures ranging from 240° to 450°C the reaction is

$$\text{SiH}_4 + \text{O}_2 = \text{SiO}_2 + 2\text{H}_2 \quad (1)$$

Shintani *et al.* (3) determined the variation of the number and dimension of SiO₂ submicron particulates dispersed in a CVD reactor as a function of CVD conditions.

The heterogeneous reaction between silane and oxygen for SiO₂ and PSG film deposition at temperatures ranging from 250° to 500°C was extensively studied (4-11). Baliga and Gandhi (7) suggest that the deposition reaction obeys the theory of heterogeneous reaction at a solid surface.

This paper presents our experimental results of SiO₂ deposition kinetics in the temperature range from 80° to 400°C on a nozzle-type reactor. In addition, we interpret our data as well as those of other workers using the bimolecular surface reaction theory (12). In this way the variation of the deposition rate with the processing variables can be explained, and thus a step in

the explanation of the complex mechanism of the reaction can be made.

Experimental

A continuous nozzle-type reactor employing separate, nitrogen-diluted oxygen and silane streams that are directed toward the substrate by laminar flow nozzles [Fig. 2D from Ref. (13)] was used for the SiO₂ film deposition. The temperature profile on the susceptor surface was measured with a Technoterm 9500 digital thermometer, and we found a $\pm 5\%$ variation around the set point value across the susceptor surface. Five percent silane in argon and oxygen, both diluted in nitrogen were used for film deposition. A total flow rate of 8.2 liters/min was maintained constant in all experiments except for the case when the effect of the carrier gas flow was studied.

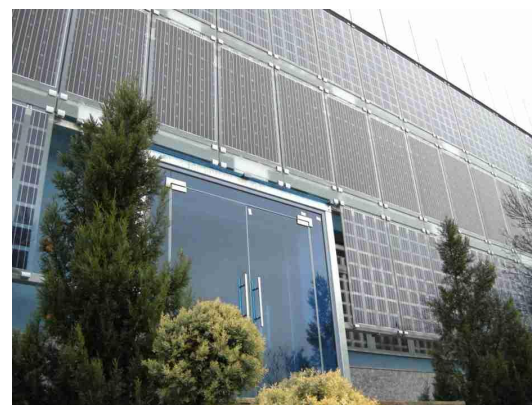
The layers were deposited on polished silicon wafers cleaned before deposition by degreasing in boiling trichloroethylene, alcohol and then etched in 5% HF. The wafers were heated on the susceptor for 5 min before deposition in order to attain equilibrium temperature.

The oxide thickness was measured by profilometer method with a stylus type profilometer, and was verified with an ellipsometer for thicknesses less than 500Å.

Results

Our experimental results of the low-temperature chemical vapor deposition (LTCVD) of SiO₂ films obtained on a nozzle-type reactor agree from a qualitative point of view with the data published for horizontal (11) and vertical (9) reactors.

Key words: silane, oxygen, adsorption.



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Societal Impact: Contribution to young scientist formation !

A SnO_2 microsensor device for sub-ppm NO_2 detection

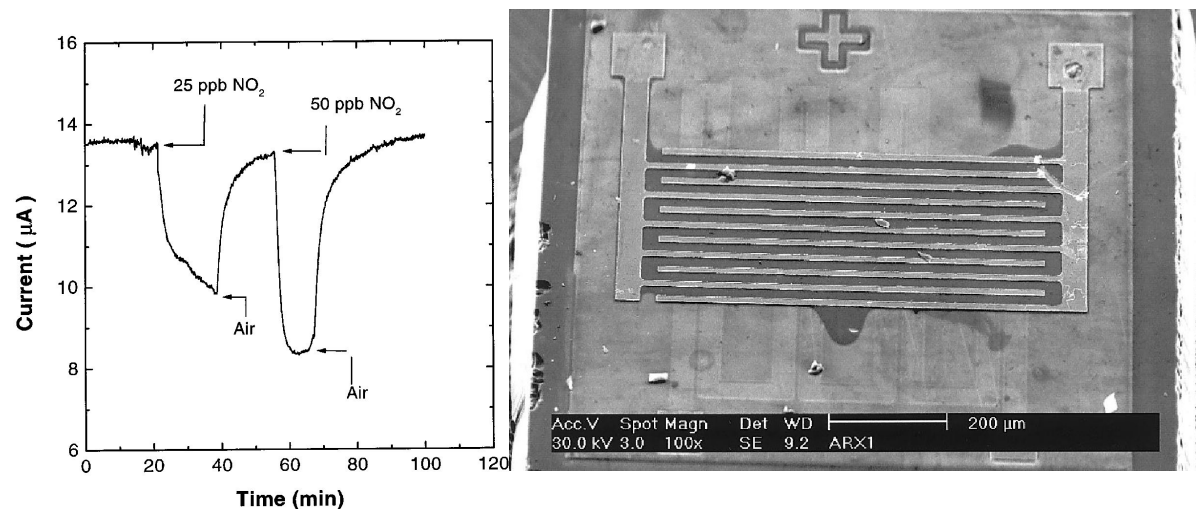
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SnO_2 sol–gel derived thin films for integrated gas sensors

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Mikko Utriainen^e, Lauri Niinistö^e

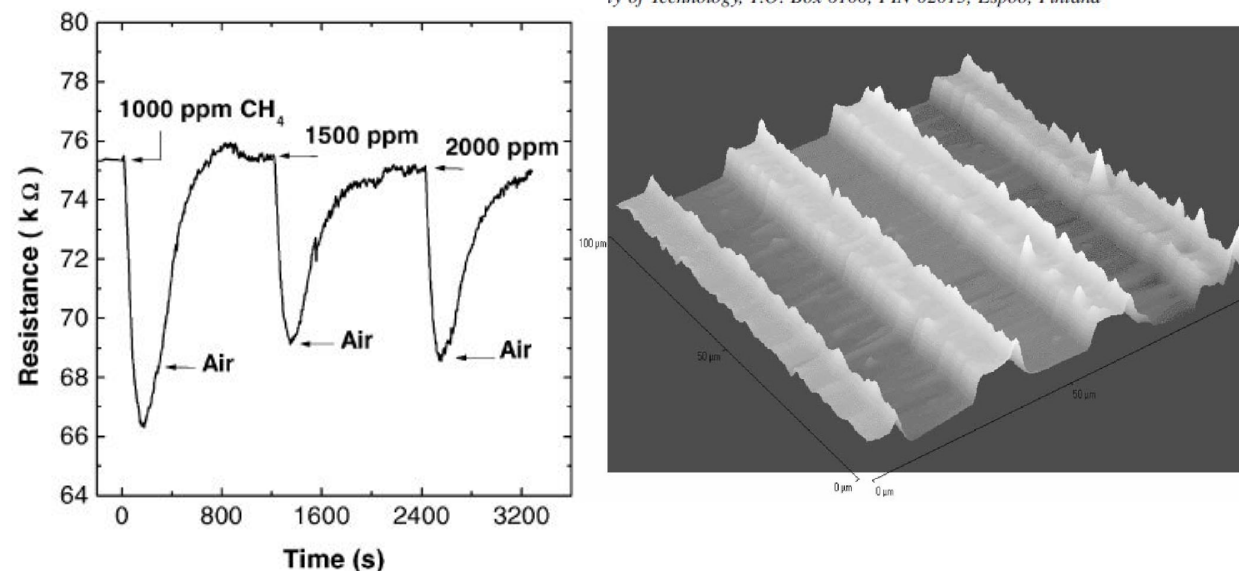
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LPCVD SiO₂ LAYERS PREPARED FROM SiH₄ AND O₂ AT 450 °C IN A RTP.

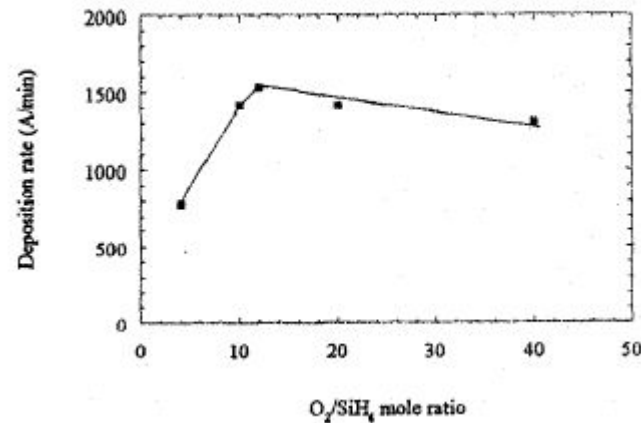
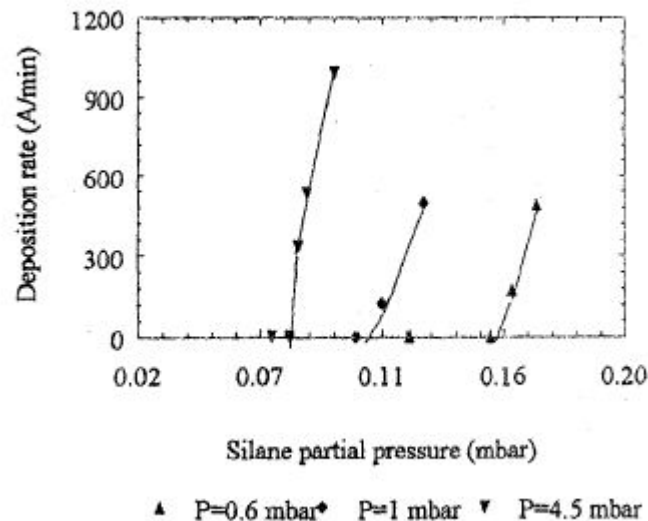
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Jisk Holleman², Pierre H. Woerlee²

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SUMMARY

In this paper experimental results of the silane oxidation kinetics in a rapid thermal low pressure chemical vapor deposition (RTLPCVD) cold wall reactor at 450 °C are presented. The deposition rate is only controlled by a threshold partial pressure of oxygen for film formation to a high deposition rate.



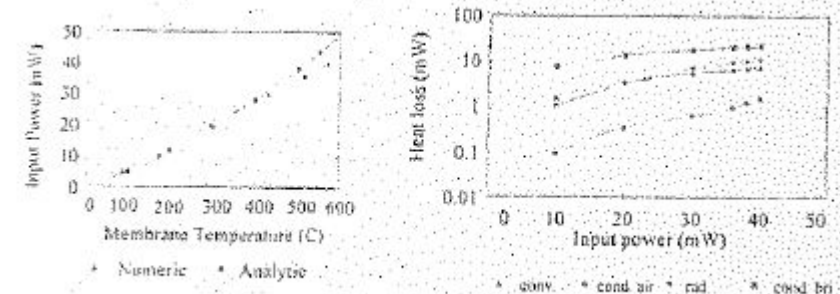
SnO₂ Sol-Gel Derived Thin Layers for Gas Sensing Applications.

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C. Flueraru¹, D. Dascalu¹,
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Abstract

Recent progresses in the field of synthesis and structural characterization of SnO₂ sol-gel derived thin films for integrated gas sensing microdevices are presented. Undoped and Sb/Pt doped SnO₂ sol-gel



Honeywell International

Article

Low Power Resistive Oxygen Sensor Based on Sonochemical SrTi_{0.6}Fe_{0.4}O_{2.8} (STFO40)

Alisa Stratulat ¹, Bogdan-Catalin Serban ^{1,*}, Andrea de Luca ², Viorel Avramescu ¹,
Cornel Cobianu ¹, Mihai Brezeanu ¹, Octavian Buiu ¹, Lucian Diamandescu ³, Marcel Feder ³,
Syed Zeeshan Ali ⁴ and Florin Udrea ^{2,4}

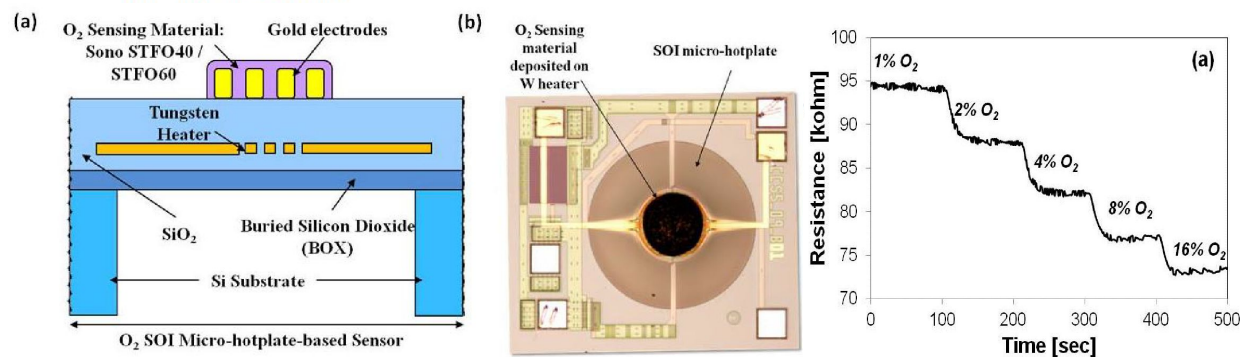
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Numerical analysis of zeptogram/Hz-level mass responsivity for in-plane resonant nano-electro-mechanical sensors

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ABSTRACT

This paper presents numerical analysis of an in-plane resonant nano-electro-mechanical (NEM) sensor based on mass-detection principle using a 3D FEM electromechanical simulation combined with a NEM/MOS hybrid circuit simulation. The self-assembled linker molecules are modeled simply by adding extra surface coating layer, and three different functionalization schemes are studied: top and bottom, only top and all-around configurations. We investigate the impacts of the coating layer mass change as well as stiffness change on the resonance frequency by varying thickness of the coating layer for all the configurations. The small signal AC analysis of the sensor is performed, and the effect of the coating layer on the output signal is studied. Mass of the coating layer is then changed in order to model the random adsorption of target molecules onto to achieve the mass responsivity of 0.05

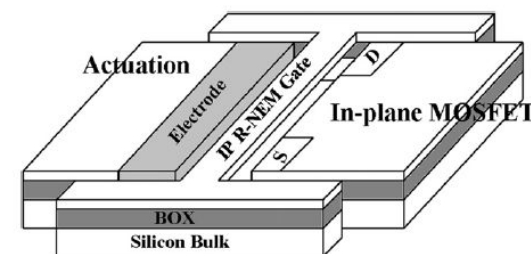
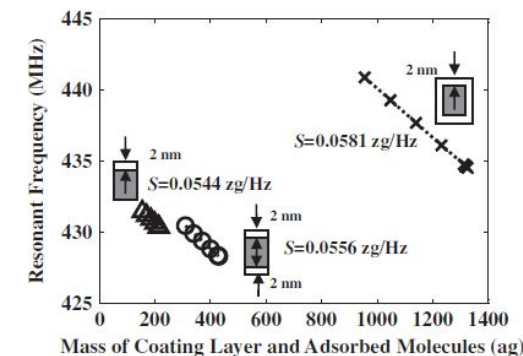


Fig. 1. The IP R-NEM sensor consists of a side electrode and a suspended beam that is integrated with the in-plane MOSFET.



Societal impact : Formation of an innovation school at Honeywell Sensor Lab Bucharest

(19) **United States**

(12) **Patent Application Publication**

Cobianu

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(43) Pub. Date: **Aug. 21, 2014**

(54) **LEAD-FREE ELECTROCHEMICAL GALVANIC OXYGEN SENSOR**

(75) Inventor: **Cornel Cobianu**, Bucharest (RO)

(73) Assignee: **LIFE SAFETY DISTRIBUTION AG**, Hegnau (CH)

(21) Appl. No.: **14/241,271**

(22) PCT Filed: **Sep. 14, 2011**

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Publication Classification

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(52) U.S. Cl. **G01N 27/413** (2013.01)

USPC **204/431**

(57) **ABSTRACT**
A lead-free, self-corrosion-free electrochemical galvanic oxygen sensor is provided. The preferred sensor includes a container, the container including a lead-free anode, an alkali electrolyte, a carbon platinized with platinum cathode and a nickel wire current collector, wherein the container further includes a diffusion barrier that causes the sensor to operate in the limiting current region.

(19) 

(11) **EP 2 813 843 A1**

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(74) Representative: **Houghton, Mark Phillip**, Patent Outsourcing Limited, 1 King Street, Bakewell, Derbyshire DE45 1DZ (GB)

(54) **Long-life, lead-free, oxygen galvanic sensor**

(57) A galvanic sensor includes a housing, an anode, a cathode, and an electrolyte. The anode includes anti-mony and is substantially free from lead and the cathode includes platinum.

EP 2 813 843 A1

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Contributions to Intellectual Property of Honeywell International on liquid level .
Cooperation with “Honeywell Process Solutions” company owned by Honeywell International



(19) United States

(12) Patent Application Publication
COBIANU et al.

(10) Pub. No.: US 2015/0168201 A1
(43) Pub. Date: Jun. 18, 2015

(54) COUPLING DEVICE FOR IMPEDANCE MATCHING TO A GUIDED WAVE RADAR PROBE

G01S 13/02 (2006.01)
H01P 1/16 (2006.01)
(52) U.S. CL.
CPC *G01F 23/284* (2013.01); *H01P 1/16* (2013.01); *G01S 7/02* (2013.01); *G01S 13/02* (2013.01)

(71) Applicant: HONEYWELL INTERNATIONAL INC., Morristown, NJ (US)

(72) Inventors: CORNEL COBIANU, BUCHAREST (RO); ION GEORGESCU, BUCHAREST (RO); MICHAEL KON YEW HUGHES, VANCOUVER (CA); STUART JAMES HEATH, SURREY (CA); FRANK MARTIN HARAN, NORTH VANCOUVER (CA)

(73) Assignee: HONEYWELL INTERNATIONAL INC., Morristown, NJ (US)

(21) Appl. No.: 14/133,110

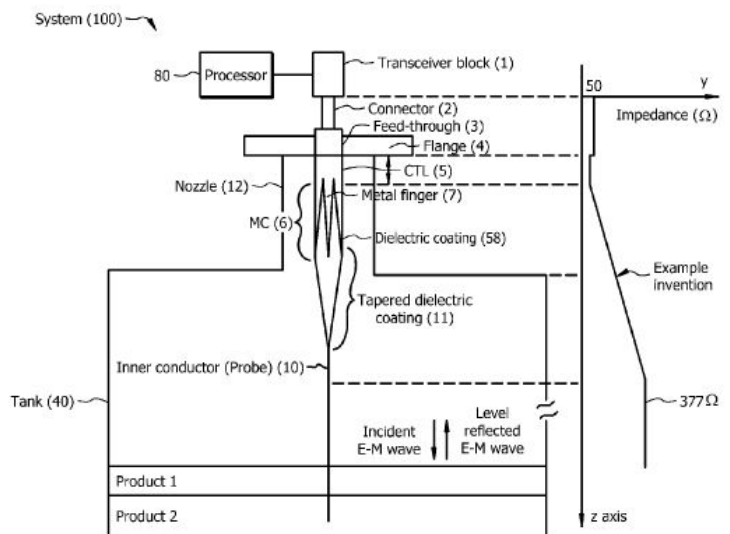
(22) Filed: Dec. 18, 2013

Publication Classification

(51) Int. Cl.
G01F 23/284 (2006.01)
G01S 7/02 (2006.01)

(57) ABSTRACT

A coupling device for impedance matching a probe of a guided wave radar (GWR) system. A feed-through is for connecting to a coaxial cable or other transmission line connector that includes an inner conductor which connects to an output of a transceiver and an outer conductor that connects to an outer metal sleeve. A subwavelength coaxial transmission line (CTL) having a length from $\lambda/5$ to $\lambda/2$ is coupled to the feed-through including an inner conductor connected to the inner conductor of the feed-through and an outer conductor connected to the outer metal sleeve. A mode converter (MC) having a plurality of metal fingers (7) of length 2λ at twenty percent is connected to the outer conductor of the subwavelength CTL, where the MC includes a dielectric coating on its inner conductor connected to the inner conductor of the subwavelength CTL.



(19) United States

(12) Patent Application Publication
COBIANU et al.

(10) Pub. No.: US 2015/0276458 A1
(43) Pub. Date: Oct. 1, 2015

(54) THREADED COUPLING DEVICE WITH NOZZLE FOR GWR MEASUREMENTS IN NON-METALLIC TANKS

Publication Classification

(51) Int. Cl.
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F16L 25/02 (2006.01)
(52) U.S. CL.
CPC *G01F 23/284* (2013.01); *F16L 25/02* (2013.01)

(71) Applicant: Honeywell International Inc., Morristown, NJ (US)

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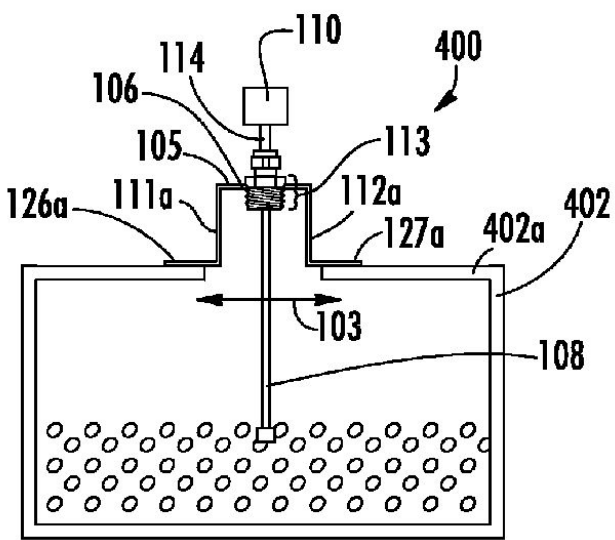
(73) Assignee: Honeywell International Inc., Morristown, NJ (US)

(21) Appl. No.: 14/229,063

(22) Filed: Mar. 28, 2014

(57) ABSTRACT

A coupling device for coupling a threaded feed-through of a process connection to provide a launcher for a non-metallic storage tank. The storage tank includes a tank aperture in its top surface. The coupling device includes a foil nozzle including an inner upper metal foil surface that includes a threaded aperture for securing the feed-through thereto, and a first and second lower metal foil surface on respective sides of the upper metal foil surface. The foil nozzle also includes a first and a second foil level transition region disposed between the respective sides of the inner upper metal foil surface and the first and second lower metal foil surface. The foil nozzle can be configured in a cylindrical, horn, or a corrugated horn shape.



Contributions to Intellectual Property of Honeywell International on SAW sensors

Cooperation with "Sensor and Control" company owned by Honeywell International



(12) **United States Patent**
Cobianu et al.

(10) **Patent No.:** **US 7,243,547 B2**
(45) **Date of Patent:** **Jul. 17, 2007**

(54) **MEMS SAW SENSOR**

(75) **Inventors:** **Cornel P. Cobianu**, Bucharest (RO);
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James D. Cook, Freeport, IL (US)

(73) **Assignee:** **Honeywell International Inc.**,
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H02N 2/00 (2006.01)

(52) **U.S. Cl.** **73/579; 310/313 B; 310/313 D; 73/702**

(58) **Field of Classification Search** **73/579; 73/702; 310/313 B, 313 D**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,100,811 A 7/1978 Cullen et al.
4,295,102 A 10/1981 Schmidt et al.
6,003,378 A 12/1999 Scherr et al.
2003/0005759 A1 1/2003 Breed et al.
2005/0056098 A1* 3/2005 Solic 73/702
2005/0062364 A1* 3/2005 Van Der Knokke 310/313 D

FOREIGN PATENT DOCUMENTS

DE 10215834 6/2003

DE 10215834 A1 * 11/2003
WO WO 0220287 3/2002
WO WO 0231461 4/2002
WO WO 2003/078950 A1 * 9/2003
WO WO 03081195 10/2003

OTHER PUBLICATIONS

Reindl, et al., "Theory and Application of Passive SAW Radio Transponders as Sensors," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 45, No. 5, pp. 1281-1292, Sep. 1998.
Hersten, et al., "An Analysis of the Normal Acceleration Sensitivity of ST-Cut Quartz Surface Wave Resonators Rigidly supported Along the Edges", 41st Annual Frequency Control Symposium, pp. 282-288, 1987.
Bull, et al., "Passive Remote Sensing for Temperature and Pressure Using SAW Resonator Devices," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control vol. 45, No. 5, pp. 1388-1392 Sep. 1998.

(Continued)

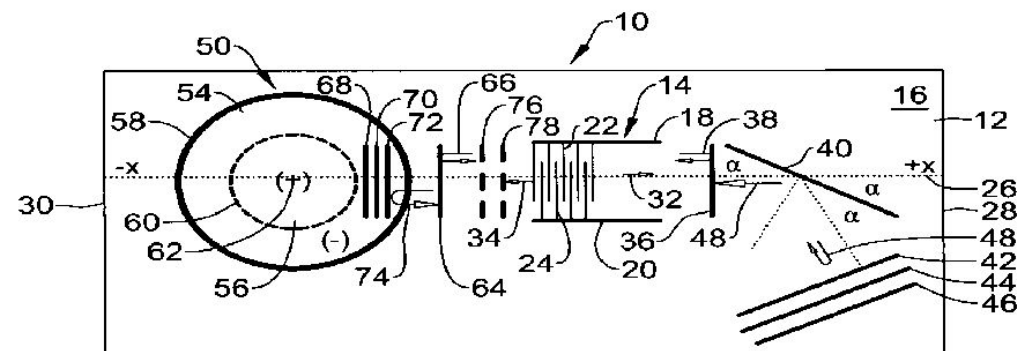
Primary Examiner—Hezron Williams
Assistant Examiner—Rose M. Miller

(74) *Attorney, Agent, or Firm*—Kris L. Fredrick

(57) **ABSTRACT**

Devices and methods for acoustically measuring temperature and pressure are disclosed. An illustrative SAW sensor can include an electrode structure that transmits and receives surface acoustic waves along a SAW delay line, a temperature sensor for measuring temperature along a first direction of the SAW delay line, and a pressure sensor for measuring pressure along a second direction of the SAW delay line. The SAW sensor can include an antenna that wirelessly transmits and receives RF signals to and from an electrical interrogator unit that can be used to power the SAW sensor.

59 Claims, 9 Drawing Sheets



Research-Innovation-Impact 2017-2025

Our contribution to Plasmonics Application in Nanophotonics



(11) **EP 4 246 597 A1**

EUROPEAN PATENT APPLICATION

(12)

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MULTIBAND, MULTI-POLARIZATION PLASMONIC PHOTODETECTOR AND FABRICATION METHOD

EP 4 246 597 A1

The present disclosure presents an innovative design concept for metal interdigitated grating-based metal-semiconductor-metal Schottky plasmonic photo-detectors, able to detect multiband, multi-polarization electromagnetic radiation in the ultraviolet, visible, near and mid infrared spectrum by using a single device with two electrodes which are both positioned on the same surface of semiconductor device, being thus a genuine planar semiconducting technology. The innovative concept shows that even if the surface plasmon enhanced photosensitive devices are wavelength and polarization-selective, it is possible to detect two and more narrow bands of the electromagnetic radiation with different polarizations by using a single-device two-electrode plasmonic Schottky photodetector where both metal contacts are placed on the device surface which is receiving the radiation. The novel design concept and associated fabrication technology will be presented by means of a generic metal-semiconductor-metal device, and specific examples will be then described.

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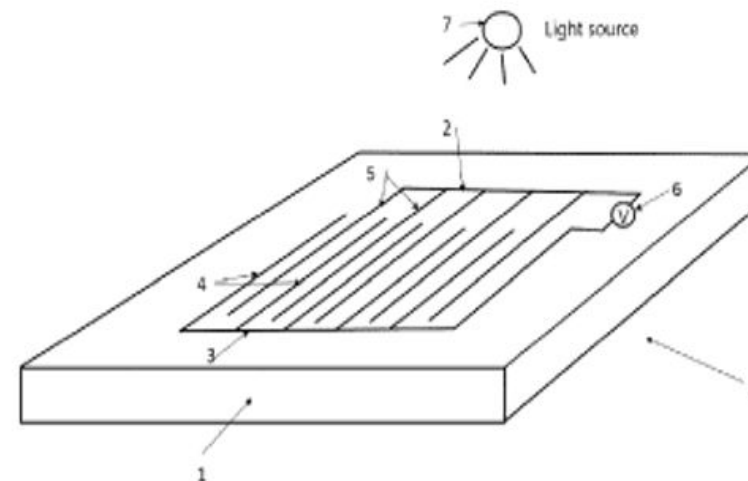
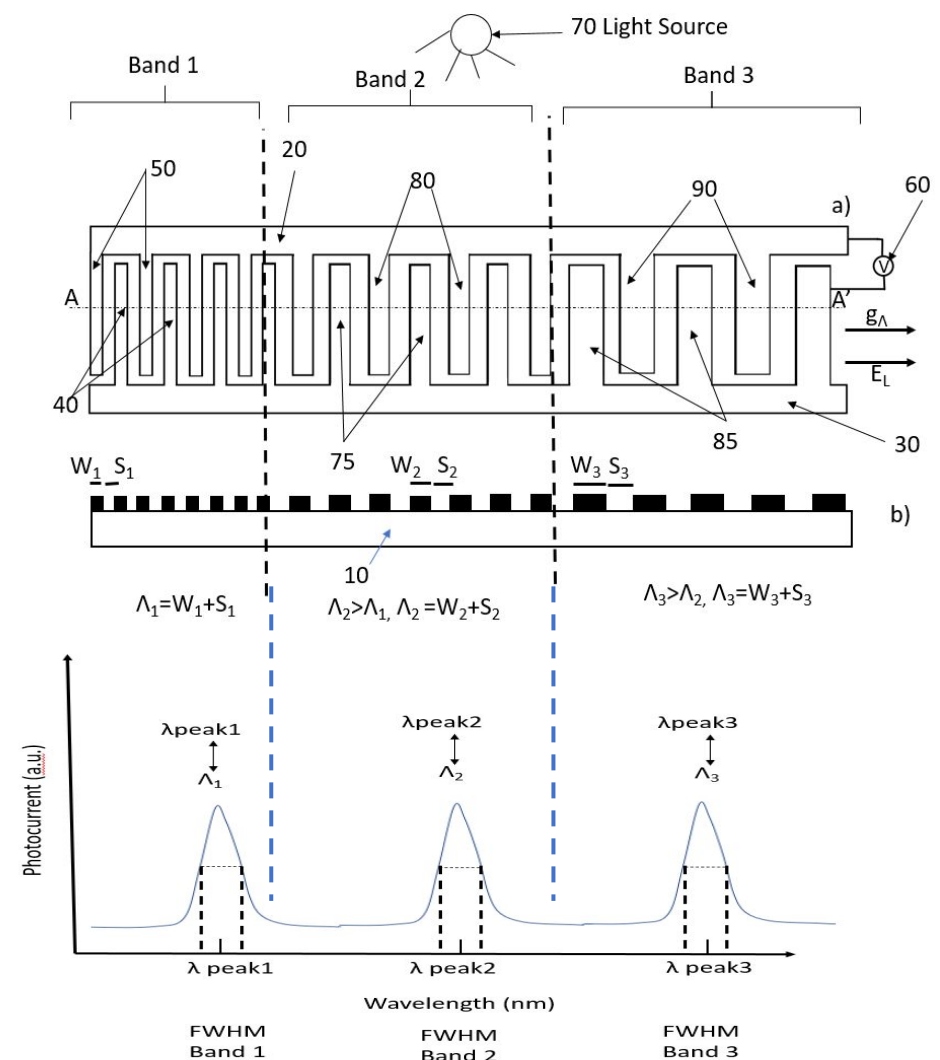
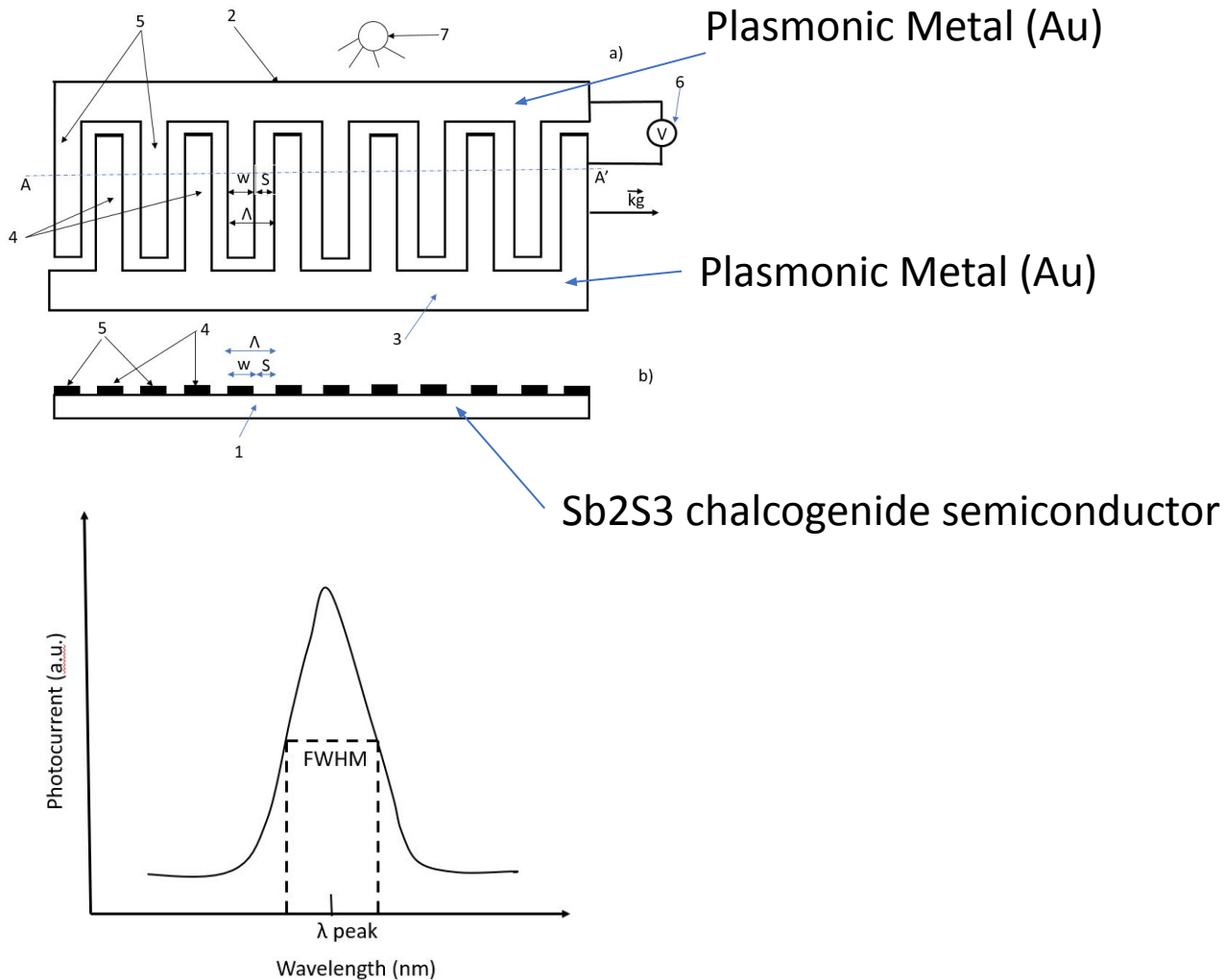


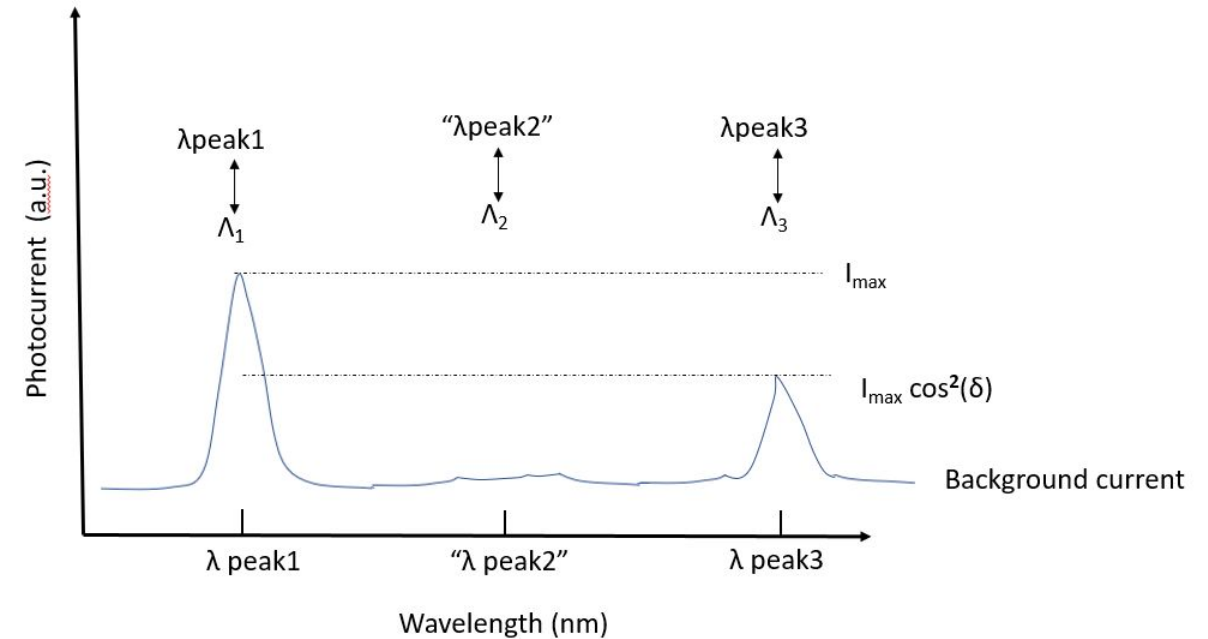
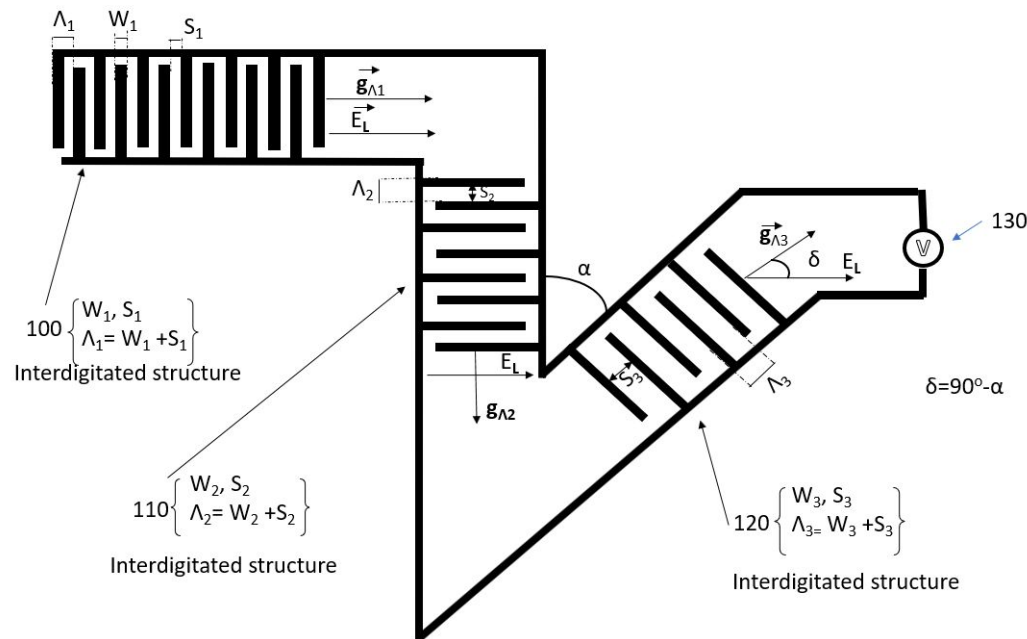
FIG. 1

OUR INNOVATIVE DESIGN-**MULTIBAND** DETECTOR

State of the art-Plasmonic Detectors



INNOVATIVE DESIGN-**MULTIBAND** and **MULTIPOLARIZATION** PLASMONIC PHOTODETECTOR





(11) EP 4 287 277 A1

(12) EUROPEAN PATENT APPLICATION

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EP 4 287 277 A1

RECONFIGURABLE PLASMONIC PHOTODETECTOR AND FABRICATION METHOD

The present invention discloses a radically-new design and fabrication concept of reconfigurable plasmonic metal-semiconductor-metal photodetectors for near-infrared (NIR) and visible spectrum, by exploiting the optical contrast properties in optical phase-change-materials (OPCM) chalcogenides like Sb_2S_3 , Sb_2Se_3 and $\text{Sb}_2\text{S}_x\text{Se}_{3-x}$, when reversibly switching from amorphous to (poly)crystalline structural state. Embodiments are related to reconfigurable chalcogenides-based plasmonic interdigitated hot electron metal-semiconductor-metal Schottky photodetectors able to perform hopping between different NIR telecom bands, like from C band to O band, or from U band to O band, when the OPCM material switches from polycrystalline to amorphous state. In the same reconfigurability idea, for example, the plasmonic photodetectors for visible spectrum are able to switch from detecting orange color to green (in case of Sb_2S_3) or blue color (in case of $\text{Sb}_2\text{S}_x\text{Se}_{3-x}$) when the chalcogenide active OPCM material is switched from polycrystalline state to amorphous. Moreover, other embodiments show that depending on application requirement, for a specific interdigitated design of the plasmonic interdigitated Schottky photodetectors one can obtain an ultrawideband multi-polarization photodetection of NIR or VIZ electromagnetic radiation

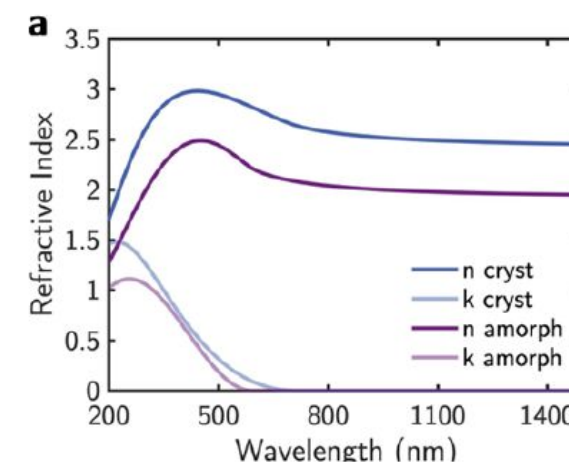
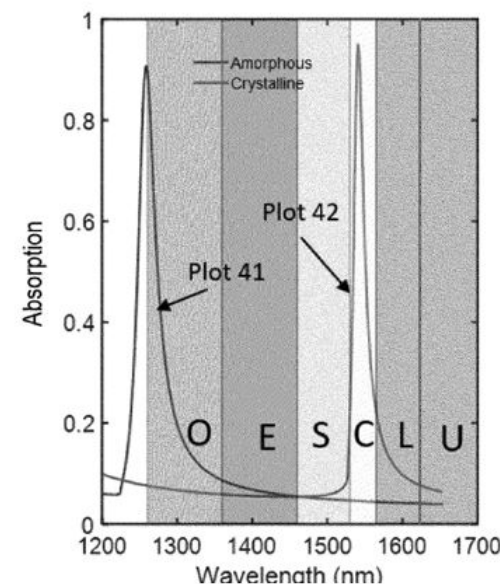
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2024



(11) EP 4 300 579 A1

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H01L 27/142^(2014.01) H01L 27/144^(2006.01)
H01L 31/07^(2012.01) H01L 31/0224^(2006.01)

(52) Cooperative Patent Classification (CPC):
H01L 27/142; H01L 28/40; H01L 31/022433;
H01L 31/07

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BA ME
Designated Validation States:
KH MA MD TN

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(54) ON-CHIP INTEGRATED PLASMONIC ENERGY HARVESTER, MICROSUPERCAPACITOR AND SENSOR, AND FABRICATION METHOD FOR THE SAME

(57) The present disclosure presents an innovative design and technology concept for an on-chip integrated self-powered nano and microsystem containing a plasmonic interdigitated metal-semiconductor-metal (SMS) Schottky thin film solar cell as energy harvester, an in-plane interdigitated supercapacitor as power source, and a sensor with interdigitated electrodes. The sensor can be an interdigitated plasmonic MSM hot electron Schottky photodetector, or an ultralow power chemiresistive gas sensor. The photoactive material of plasmonic

solar cell and photodetector and the electroactive material of microsupercapacitor are based on the same chalcogenide semiconductor, like Sb_2S_3 , and similar materials. The three modules of the self-powered on-chip integrated nano and microsystem are all connected in series and have a common electrode between the solar cell and supercapacitor and another one between the supercapacitor and the sensor. Novel design concepts for multi-band, chirped wideband and, multi-polarization plasmonic solar cells and photodetectors are also disclosed here.

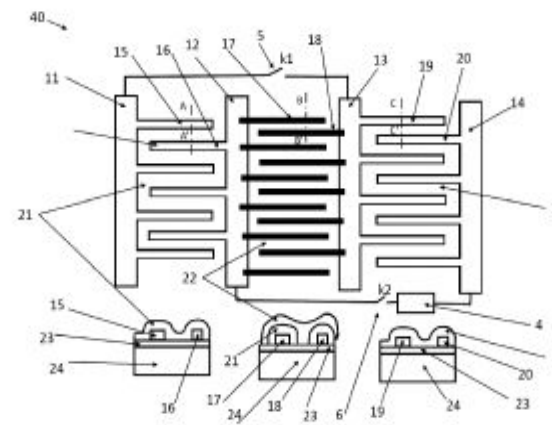


Fig. 2

Processed by Luminess, 75001 PARIS (FR)

EP 4 300 579 A1



Funded by
the European Union



Project financed from the Horizon Europe Work Program 2021-2027,
Grant agreement 101087007-eBio-hub — HORIZON-WIDERA-2022-TALENTS-01

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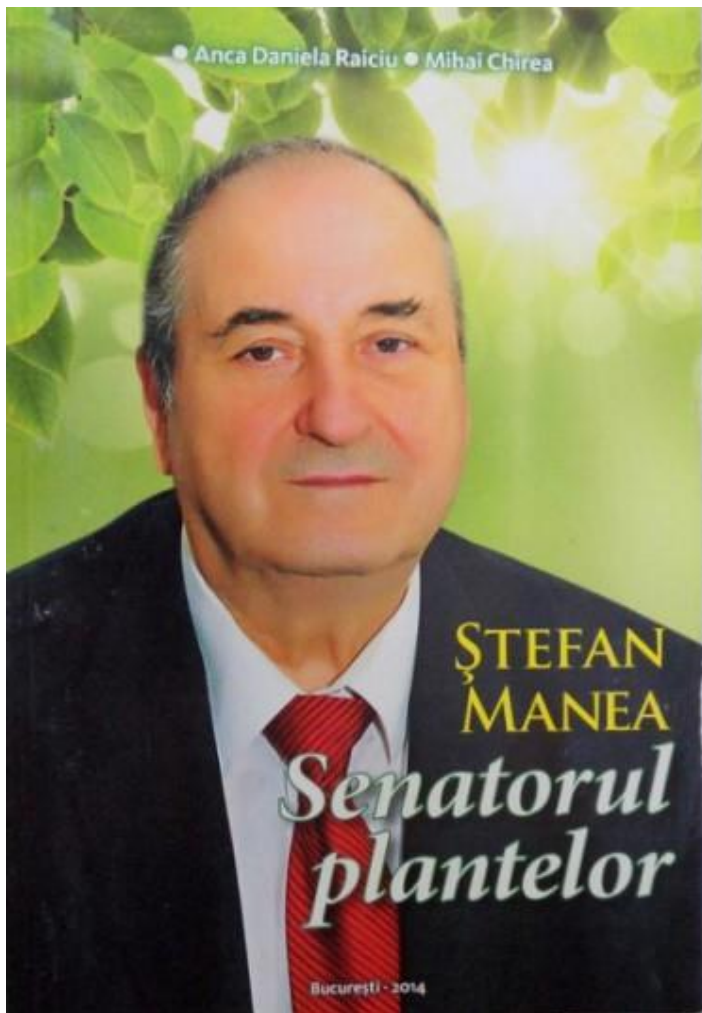


Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.



HOFIGAL
Natura nu minte niciodată





*“Suntem țara
cu cel mai bun
pământ. Dar
nu știm să-l
prețuim!”*

Hofigal a fost infiintata in Martie 1990.

Hofigal este una dintre ***marcile*** celebre cand vine vorba despre produse galenice homeopate, gemoderivate si fitoterapeutice din Romania, fabricate sub forma de:

- ◆ suplimente alimentare
- ◆ cosmetice
- ◆ ingrediente active de origine vegetala
- ◆ ceaiuri.

200 angajati





25 de hectare destinate agriculturii ecologice
28 de culturi ecologice



Din materiile prime astfel obtinute, aplicand cele mai avansate tehnologii in conformitate cu regulile internationale de Buna Practica de Fabricatie, a fost dezvoltat portofoliul Hofigal.





Infrastructura HOFIGAL

- ▶ 2022-2023 - Linie de productie Capsule Tari
- ▶ 2024-2025 - Linie automata de productie de numarare si ambalare capsule si comprimate

Laborator propriu de auto control

- Laborator de control microbiologic
- Laborator de control fizico-chimic

Tehnici performante de analiza HPLC, GC-MS, AAS



PRODUSUL HOFIGAL

Infrastructura
de cercetare
proprie



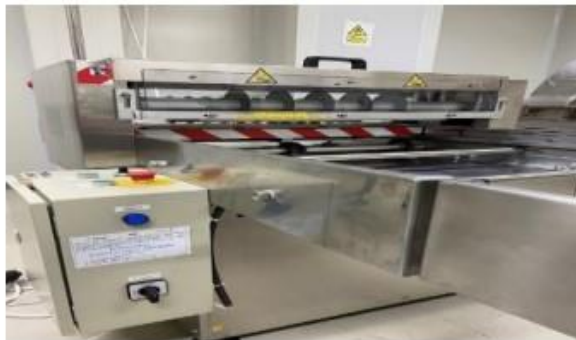
38 de Proiecte de Cercetare nationale si internationale
(8 Proiecte 2020-2023)

In portiofoliu HOFIGAL se afla 65 Marci, 30 Desene si
modele precum si un număr de 50 Brevete de inventie
inregistrate la OSIM.

1. PN-IV-P7-7.1-PTE-2024-0607 Advanced ecological solutions to increase the food safety of vegetables and fruits, from producer to consumer
2. PN-IV-P7-7.1-PED-2024-2366 Integrating Sustainable Strategies for Post-Harvest Control of Fruits through Bioactive Edible Coatings
3. PN-IV-P7-7.1-PED-2024-2526 Novel food supplement with enhanced biological activity, based on fatty and essential oils, with hepatoprotective potential
4. PN-IV-P7-7.1-PED-2024-0360 Hydrogels loaded with plant extract antioxidant molecules for enhance of solar protection lotions action
5. PN-IV-P7-7.1-PED-2024-0318 Innovative approach for the protection of medicinal and aromatic plant crops - between circular bioeconomy and nanotechnology
6. PN-IV-P7-7.1-PED-2024-0703 Liposomal nanosystems with microbial inulinase for the prevention of metabolic and nutritional diseases
7. PN-IV-P7-7.1-PED-2024-2055 Molecularly imprinted-solid phase extraction technology for catechin tannins from shrub wooden parts
8. PN-IV-P7-7.1-PED-2024-2238 Integration of valuable autochthone herbals for novel lipid nanostructured cream used in varicose vein therapy



Baton Proteic
Baton Digestiv
Baton Energizant



supliment alimentar
pentru mentinerea
unui sistem venos
sanatos si care sa
sustina circulatia
periferica



1 Article

2 Antioxidant and chemical characterization of sea buckthorn
3 (*Hippophae rhamnoides*) byproducts for further valorization in
4 nutraceuticals

5 Cristina Mihaela Luntraru¹, Livia Apostol^{2*}, Oana Bianca Oprea³, Mihaela Neagu¹, Adriana Florina Popescu¹,
6 Justinian Andrei Tomescu¹, Mihaela Mulescu⁴, Iulia Elena Susman and Liviu Gacau^{2,4,5}

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Abstract: The by-product resulting from obtaining sea-buckthorn (*Hippophae rhamnoides*) juice can be a functional food ingredient, being a great source of bioactive compounds, like polyphenols, flavonoids, minerals and fatty acids. Two extracts were obtained by two different methods using 50% ethyl alcohol solvent, namely through maceration - recirculation (SB-ME) and through ultrasonication (SB-USE), followed by concentration. Next, there was performed a characterization of the total polyphenols, and flavonoid content, antioxidant capacity, mineral contents and fatty acids profile of: sea-buckthorn waste (SB sample), extracts (SB-ME and SB-USE samples) and the residues obtained after extractions (SBM and SBUS samples). The results show that polyphenols and flavonoids were extracted better by ultrasonication. Also, the antioxidant activity of SB-USE sample was with 91% higher (expressed in Trolox equivalents), and with approximately 45% higher (expressed in FeSO₄·H₂O equivalents) than SB-ME sample. Regarding the extraction of minerals, it was found that both concentrated extracts had almost 25% of the RDI value of K and Mg, and also the content of Zn, Mn and Fe is significant.

Citation: Lastname, F.; Lastname, F.;

Lastname, F. Title. *Foods* 2021, 10, x.

<https://doi.org/10.3390/xxxxx>

Academic Editor: Firstname Last-
name

Received: date

Accepted: date

Published: date

30 The general conclusion is that using the ultrasonic extraction method, followed by a process of
31 concentrating the extract, a superior recovery of seabuckthorn byproducts resulted from the juice
32 extraction can be achieved.



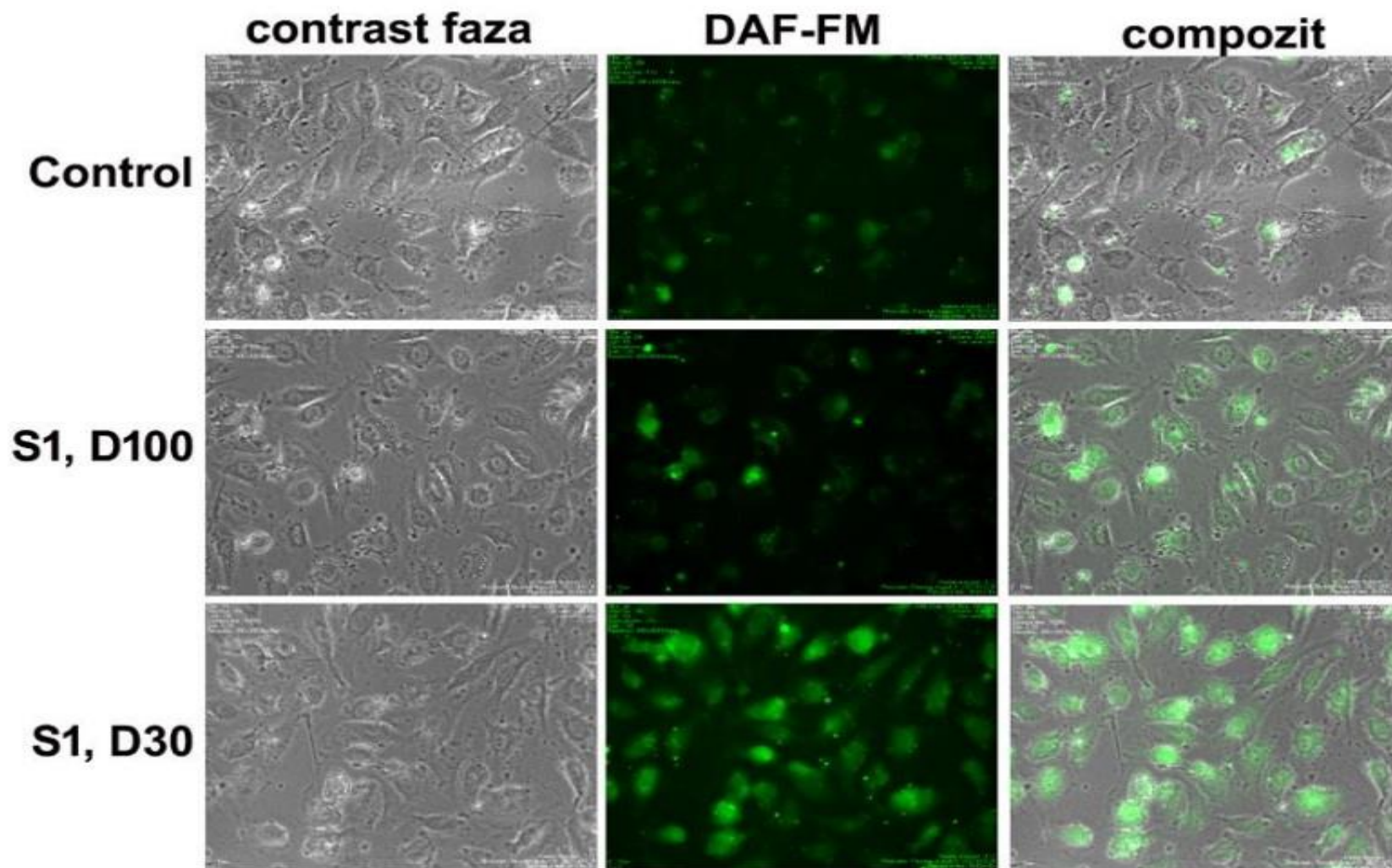


Fig. 17. Evaluarea efectului de vasodilatator a suplimentului S1*, intracelular prin colorarea cu DAF-FM a speciilor de NO⁻

În cazul celulelor tratate cu supliment alimentar S1 la diluțiile D30 și D100 semnalul de fluorescență este mult mai puternic, pentru D30 fiind cel mai ridicat.

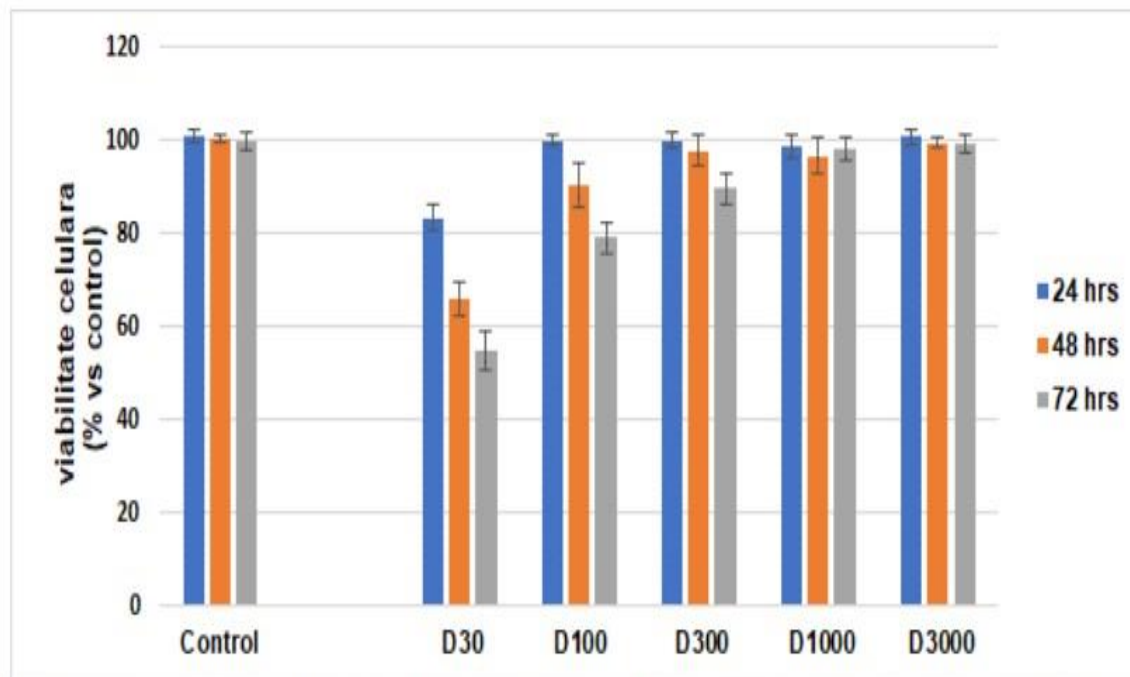


Fig.13. Viabilitatea celulelor endoteliale la tratamentul cu diferite concentrații de supliment alimentar SI* pe intervalele de timp de 24, 48 și 72 de ore

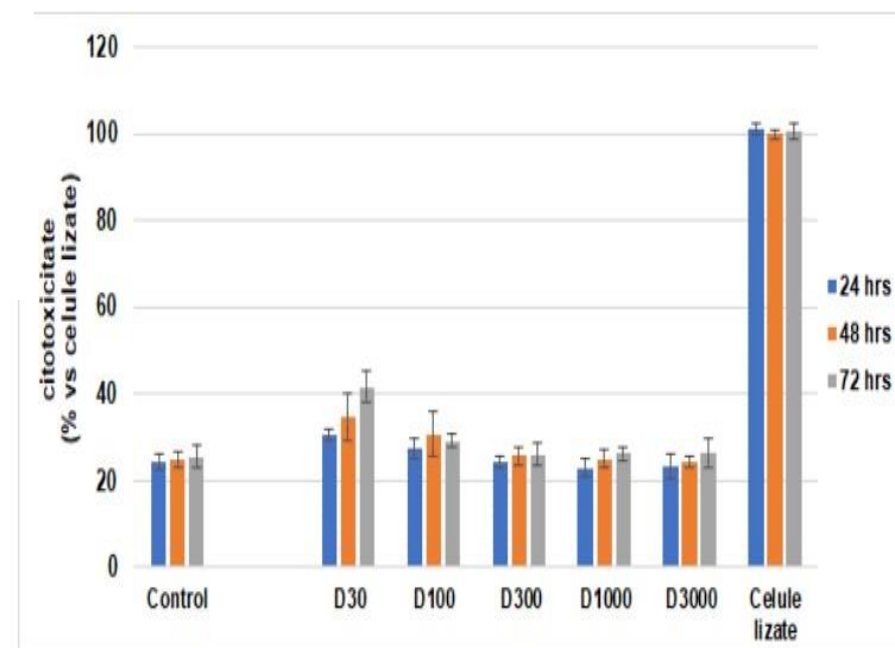


Fig.14. Citotoxicitatea indusă de suplimentul alimentar pe celulele endoteliale, pe intervalele de timp de 24, 48 și 72 de ore

Programul Cooperare Europeană și Internațională, Subprogramul 3.5. Alte inițiative și programe europene și internaționale – Proiecte EUREKA Tradițional – Competiția 2019, susținut prin Contractul de finanțare nr. 220/2020



 PHARMACOIDEA



CALITATEA HOFIGAL

In ceea ce priveste calitatea produselor, indiferent de stadiul in care se afla, acestea indeplinesc cerintele Farmacopeei Europene, completate cu cele ale altor farmacopei de circulatie internationala si conditiile de calitate aferente Fislofiei Calitatii Hofigal.

CERTIFICATE ISO:

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018
- ISO 22000:2019

emise de catre -TÜV Thüringen/Germania

CERTIFICAT



**Pentru sistemele de management
ISO 9001:2015, ISO 14001:2015
și ISO 45001:2018**

Aplicarea cerințelor corespunzătoare standardelor de referință a fost demonstrată și este atestată, conform procedurilor de certificare, pentru organizația



S.C. HOFIGAL EXPORT-IMPORT S.A.
Intrarea Serelor nr. 2, sector 4,
042124 București
România

Domeniul de aplicare

Cercetare-Dezvoltare, producție și distribuție suplimente alimentare, substanțe active naturale de origine vegetală, animală și produse ale stupului, cosmetice, ceaiuri, culturi ecologice de plante aromatice, medicinale și tehnice și produse pe bază de cânepă (Cannabis sativa L.)

Numărul de înregistrare al certificatului: TIC 15 100 74334
TIC 15 104 7323
TIC 15 118 19032

Valabil până la: 2025-01-02
Valabil începând cu: 2022-01-31

Raport de audit Nr.: 3330 29JS P0

Această certificare a fost realizată în conformitate cu procedurile de auditare și certificare ale TIC și se supune auditurilor de supraveghere desfășurate în mod regulat.



TÜV Thüringen e.V.
Organismul de certificare pentru
sisteme de management și personal



Jena, 2022-01-31



Pe certificatele originale
este aplicată o hologramă.

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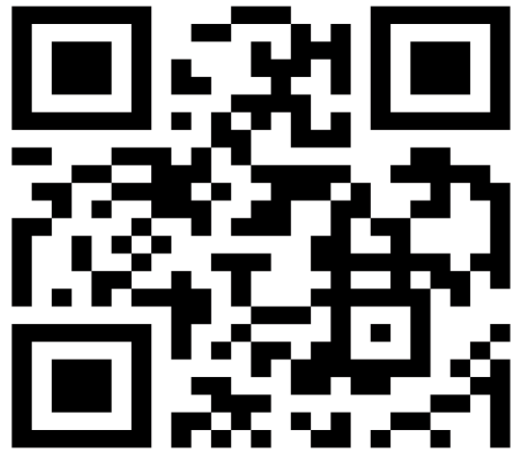


**LOCUIEȘTE ALĂTURI DE NOI
LA BREAZA!**

Avem grijă de tine!



Va multumesc pentru atentie!



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Tehnologii cuantice economie circulară și Green deal

**BIOAQUA – nanofluid din apă epurată , fără pesticide, hormoni,
farmaceutice, fără PAFS, fără microplastice, coerentă cuantic, structurată,
activată, sterilizată fără clor, un nou fluid pentru irigare și creștere producție
agricolă**

Partea I

Kematonic prezintă nanotehnologia NANOSUPERCRITIC, aplicabilă în stațiile de epurare menajere de orice mărime , tehnologie care asigură transformarea apei epurate în BIOAQUA pentru agricultură biologică ecologică AGROBIO, apă care îndeplinește condițiile din REGULAMENTUL 2020/741 AL PARLAMENTULUI EUROPEAN ȘI AL CONSILIULUI din 25 mai 2020 pentru apa de irigații, și care în plus realizează :

- A.
 - a) Sterilizarea BIOAQUA pentru irigație
 - b) Tratarea apei epurate cu câmpuri electromagnetice, câmpuri electrice și plasmă rece având ca rezultat o apă curentă cuantic, structurată, activată magnetizată și ionizată
 - c) Îmbogățirea apei epurate cu nanoparticule de oxigen O₂ -NPs cu nanoparticule de azot și apă oxigenată pentru obținerea oxifertigării și creșterea producției agricole cu 40%
 - d) Eliminarea completă a plasticului din BIOAQUA prin lichefiere hidrotermală la temperatura maximă de 400° C și presiuni mai mari de 200 Bari. Eliminarea pesticidelor, hormonilor, farmaceuticelor, a PAFS și dioxinelor. Aceste condiții sunt realizate în apa supercritică cu nanobule de aer și unde ultrasonice din nanotehnologia NANOSUPERCRITIC
 - e) Eliminarea completă a substanțelor organice toxice și alergenilor

- f) Producția de fertilizanți organici verzi activați NANOBIOFERTILIZER sub formă de nanoparticule de carbon de azot, de potasiu, de fosfor, de oligoelemente folosind un procedeu de producție nanoparticule de grafit sau grafene

În aceste condiții stațiile de epurare rurale mici și mijlocii devin sursă de apă de irigație și fertilizanți pentru Agrobio

B. Nanotehnologia NANOSUPERCITIC realizează de asemenea :

- a) Producția de hidrogen verde prin electroliza ultrasonică a apei la consumuri energetice mai mici de șase ori decât electroliza convențională. Acest consum energetic se realizează datorită apei supercritice cu nanobule de aer și unde ultrasonice, nanotehnologie în care rezultă temperaturi de 20000 de grade Celsius și presiuni de 1000 bar. Apa supercritică rezultată provoacă ruperea legăturilor de hidrogen din H₂O

În același timp se obține producția de O₂ molecular, care prin recirculare este transformat în nanoparticule de O₂ -NPs , care rămân în BIOAQUA ca nanobule între 1 și 3 luni

Apa supercritică de asemenea produce plasmă rece și raze ultraviolete. Ultravioletele și apa oxigenată vor produce sterilizarea completă a BIOAQUA și descompunerea prin lichefiere hidrotermală a pesticidelor, hormonilor și farmaceuticelor la temperaturi mai mari de 400° c și presiuni de 220 bari.

- b) Apa supercritică activată , sterilizată fără clor, fără plastic, determină precipitarea sărurilor și altor componente și generarea de nanoparticule ale componentelor. Astfel se obțin nanoparticule de carbon, de potasiu, de fosfor, de azot, de oligoelemente. Se generează Biocompoziți în jurul carbonului foarte absorbant, cu nutrient, cu oligoelemente, biocompoziți binari sau ternari (de exemplu –NPK, azotat de amoniu fosfat de amoniu, struvit, sulfat de amoniu)

Toți aceștia formează un fertilizant organic verde activat sub formă lichidă în BIOAQUA sau solidă după eliminarea apei. Se realizează astfel

economia circulară prin care deșeurile din apa uzată se transformă în NANOBIOFERTILIZER- un produs ecologic care înlocuiește / elimină complet îngrășămintele chimice sintetice.

NANOBIOFERTILIZER este un produs 100% bio

- c) Urmare acțiunii câmpului electromagnetic și a câmpului electric din faza de apă supercritică, apa epurată suferă transformări , primind calitatea de apă structurată, activată, coerentă cuantic; apa epurată devine astfel BIOAQUA . Irigarea cu această apă combinată cu conținutul de nanobule de O₂ –NPs, N₂ -NPs realizează creșterea producției agricole cu până la 30% și fertilizarea solului prin acțiunea O₂ asupra radicalilor

C. BIOAQUA poate fi stocată și se poate folosi în mai multe domenii.

Stocarea se poate face în mai multe compartimente

- a) BIOAQUA ca fluid special de irigare și creștere producție agricolă
- b) BIOAQUA pentru producția de alge; algele produse asigură următoarele resurse posibile :
1. Producție suplimentară de H₂ verde din descompunerea glucozei C₆H₁₂O₁₂ în apa supercritică
 2. Producția de nutrețuri pentru animale
 3. Producția de materii prime pentru industria de cosmetice
 4. Îngrășământ agricol ecologic
 5. Producția de nanoparticule de carbon sub formă de grafene
- c) BIOAQUA cu NBG- O₂ ca sursă de apă de băut pentru animale (porci vite păsări). Adăparea animalelor cu BIOAQUA are ca rezultat producția de lapte, ouă, carne suplimentată cu circa 40% .
- Astfel se realizează prin utilizarea BIOAQUA o zoologie bio
- d) BIOAQUA de la punctele a, b, c ulterior poate fi folosită pentru producția de pește. Se realizează o diversificare a rezultatelor din AGROBIO și ZOOBIO și economia circulară cu BIOAQUA

e) Prin stocarea BIOAQUA și NANOBIOFERTILIZER se poate realiza o irigare combinată cu cele două medii, asigurând creșterea producției agricole Bio AGROBIO cu 40- 50%

f) NANOBIOFERTILIZER are un conținut de nanoparticule de carbon C-NPs, care este o formă de captare a CO₂, realizând astfel prima etapă a CO₂ CCS. Prin utilizarea agricolă a NANOBIOFERTILIZER se realizează etapa 2-utilizare CO₂ CCSU

Astfel NANOBIOFERTILIZER captează , stochează CO₂ și este utilizat pentru acțiunea Carbon Biofarming a CE, fiind valorificat prin certificate de CO₂ fiind complet biocompatibil, având C-NPs grafit

D. H₂ rezultat din nanotehnologia NANOSUPERCRITIC poate fi utilizat pentru cogenerarea de energie electrică și termică. Energia electrică asigură independența energetică a stației de epurare. Se asigură și energia electrică și termică pentru alge și Sere bio

E. Nanotehnologia NANOSUPERCRITIC permite economia de apă între 10 și 40% prin utilizarea la mai multe locații folosind economia circulară

Exemple de utilizare multiplă :

1. Apa uzată este transformată în BIOAQUA cu conținut de O₂ și N₂, stocată pentru prima utilizare în producția de alge; utilizarea următoare este în apă de băut pentru animale (porci vite păsări) a treia utilizare este pentru irigare sau creștere pește. Se poate de asemenea utiliza ca apă de proces pentru industria alimentară (producția de lapte carne conserve)
2. Apa uzată este transformată în BIOAQUA; urmează producția de NH₄ verde cu bacterii, apoi producția de alge, apoi utilizarea BIOAQUA ca apă de irigație, apoi ca apă de proces în industria alimentară. În acest exemplu NH₄ verde și algele sunt surse de hidrogen verde prin recircularea în NANOSUPERCRITIC

F.

Producția cu o soluție originală de nanoparticule de carbon CO₂ -NPs cu conținut de potasiu K-NPs, de fosfor P-NPs, de azot N₂ -NPs , de oligoelemente

Se poate obține carbon din substanțele organice sau din biogazul rezultat din fermentarea în aerobă CH₄. Se obțin prin tratarea CH₄ în NANOSUPERCRITIC nanobule de carbon -element esențial în fertilizarea solului și H₂ verde în cazul în care se dorește producerea de H₂ verde prin electroliza ultrasonică în apa supercritică. Acest hidrogen verde consumă 1/6 din energia electrică consumată pentru obținerea H₂ prin electroliza convențională

G.

BIOAQUA poate avea următoarele componente :

Varianta 1: BIOAQUA plus nanoparticule O₂ -NPs și N₂ -NPs

Varianta 2: Varianta 1 completată cu nanobule de C NBG-CO₂ , NBG- O₂, NBG-N₂

Varianta 3 : Varianta 1 + substanță organică bogată în carbon cu descompunerea parțială a substanțelor organice

Varianta 4: Varianta 2 sau 3 plus amoniu NH₄ produs de cianobacterii

NANOBIOFERTILIZER conține fosfor, azot, potasiu, nutrienți esențiali conținuți în nămolurile din stațiile de epurare menajere ,din deșeuri umane fără metale grele

Nanobiofertiliser este sursă de carbon sub formă de grafit sau grafen

Concluzie

Cel mai bun fertilizant natural agricol este gunoiul de grajd. Acesta după fermentare conține substanțe organice, conține componentele din hrana animalelor, inclusiv pesticide, hormoni, farmaceutice. NANOBIOFERTILIZER conține nutrienți de bază, oligoelemente, este sterilizat fără clor. Nu conține pesticide, hormoni, farmaceutice, PAFS, dioxine , PCB. Poate conține substanță

organică special reținută , combinată cu BIOAQUA; conține O₂ -NPs , N₂ -NPs sau NH₄, forme care asigură creșterea producției agricole prin oxifertigare.

Concluzia finală

Kematronic propune complexe care utilizeaza resursele rezultate din epurarea apelor uzate rurale cu NANOSUPERCITIC cu stocarea BIOAQUA fără vărsare în râuri sau lacuri

Complexele pot fi realizate în mai multe variante:

- Complex varianta 1: stație de epurare rurală + stocare BIOAQUA + producție alge + sere bio
- Complex varianta 2: complex varianta 1 + apă pentru animale în zootehnie

PARTEA II

Urmare cercetărilor din ultimii ani KEMATRONIC prezintă noile aplicații ale nanotehnologiilor :

Nanotehnologiile dezvoltate de KEMATRONIC se bazează pe teoria câmpurilor cuantice ca urmare a efectelor sinergice ale câmpului electric, câmpului electromagnetic, câmpului de presiune și a câmpului de unde ultrasonice

Principalele nanotehnologii promovate de KEMATRONIC sunt :

- a) Captarea și transformarea gazelor, în special CO₂ în nanobule de gaze în lichid din gazele arse și treapta biologică
- b) Generarea de apă supercritică cu nanobule de aer și ultrasonarea amplificată cuantic
- c) Amplificarea producției de biogaz cu injecție de nanobule de CO₂ cu creșterea producției cu 25- 74% cu nanotehnologie NANO-BIOGAZ
- d) Eliminarea nămolului activ prin gazeificarea cu Nanotehnologii NANO-BIO
- e) Post -tratarea nămolului fermentat cu nanotehnologia NANO-TERMO folosind energia termică produsă prin cogenerare
- f) Producția de fertilizanți organici verzi din nămolul mineral sub formă de nanoparticule generate în apa supercritică și unde ultrasonice
- g) Producția de hidrogen verde combinată cu cogenerarea de energie electrică și termică

Aceste nanotehnologii permit ca urmare a obiectivelor CE creșterea producției de energie regenerabilă din biomasă sub formă de energie continuă independentă diferită de energia solară și eoliană - energie regenerabilă discretă. Energia regenerabilă din biomasă , inclusiv din nămolul din stațiile de epurare este continuă și nu necesită stocare externă.

Nanotehnologiile rezultate din cercetările KEMATRONIC realizează :

- A. Epurarea apelor uzate fără producție de nămol activ și transformarea apelor epurate în apă de irigație, apă sterilizată fără pesticide, hormoni,

farmaceutice, fără PAFS, apă cu structură coerentă cuantic, folosind apa supercritică cu nanobule de aer și ultrasonarea amplificată

- B. Gazeificarea nămolului în apa supercritică și hidroliza termică
- C. Transformarea nămolului mineral în fracțiunea organică solidă sub formă de nanoparticule de nutrienți și oligoelemente
- D. Creșterea și stocarea CO₂ din gazele arse în nanobule de CO₂ în lichid
- E. Amplificarea producției de biogaz în metantancurile existente în stațiile de epurare și în uzinele de biogaz

Aplicații concrete

I. Stații de epurare existente mari și mijlocii

Prin aplicarea nanotehnologiei NANO-BIOGAS combinată cu nanotehnologia NANO-TERMO și NANOSUPERCITIC în fermentatoarele existente se realizează:

- Creșterea producției de biogaz cu 25- 74% și creșterea producției de energie electrică și termică cu același procent
- Eliminarea a 40% din substanță organică rămasă în nămol cu nanotehnologia NANO-TERMO; se utilizează căldura energia termică conținută de gazele arse sau rezultată din cogenerare, tratamentul biomasei 24- 36 de ore în reactor separat. Simultan se elimină 40% din NH₄ din nămolul fermentat
- Din reactorul NANO-TERMO se extrage nămolul mineral rămas după tratare. Pentru transformarea acestui nămol în fertilizant organic verde se poate utiliza nanotehnologia NANOSUPERCITIC, care realizează un fertilizant organic verde (NANOBIOFERTILIZER) sub formă de nanoparticule de nutrienți și oligoelemente. Cu energia termică produsă de cogenerare fertilizantul se poate transforma în forma lichidă, semi lichidă sau solidă. Forma solidă permite stocarea, transportarea pentru utilizare agricolă. În acest caz stațiile de epurare mari și mijlocii devin furnizor de energie electrică, energie termică, fertilizanti organici verzi și chiar apă de irigație. Se obține reducerea importantă de costuri de operare, cu tratarea nămolului, se reduce poluarea generată de transportul și depozitarea nămolului din statele de epurare menajere. Se

obține de asemenea decarbonatarea completă a nămolului prin recircularea CO₂ și accelerarea producției de biogaz

II. Stațiile de epurare mijlocii și mici (rurale) noi și existente

Prin aplicarea nanotehnologie NANO- BIO se obțin următoarele rezultate:

- Transformarea apelor uzate în ape de irigație sterilizate, fără pesticide, hormoni, farmaceutice, fără PAFS, ca apă structurată, coerentă cuantic, prin apa supercritică, nanobule de aer și ultrasonare amplificată
- Producția de hidrogen verde rezultată din gazeificarea nămolului activ rezultat din descompunerea substanțelor organice
- Producția de fertilizant organic verde sub formă de nanoparticule rezultat din precipitarea în condiții de apă supercritică cu nanobule de aer și sonificarea amplificată cuantic
- Producția de energie electrică și termică în cogenerare din hidrogen verde sau producția de energie
- Energia termică rezultată se folosește pentru producția de fertilizanți organici verzi activați sub formă lichidă sau solidă
- Se realizează decarbonatarea completă a stațiilor de epurare prin captarea și transformarea CO₂ în NBG- CO₂ și transformarea în nanoparticule de carbon organic, astfel carbonul devine sursa principală pentru producția de humus, rezultând referilizarea solului. Este o soluție ideală pentru utilizarea acțiunii Carbon Farming a CE, care asigură venituri din CCSU (captare, colectare, stocare și utilizare a carbonului) cu certificate cu obținerea de certificate de carbon atât pentru captare cât și pentru utilizarea agricolă

PARTEA III

NANOTEHNOLOGIA-O SOLUTIE DE CRESTERE PRODUCTIE BIOGAZ SI ELIMINARE NAMOL BIOLOGIC

Având în vedere necesitatea creșterii producției de biogaz, conform directivelor CE, ca înlocuitor al gazului natural și conform experienței acumulate în realizarea de stații de epurare moderne și a cercetărilor din ultimii 5 ani în domeniul nanotehnologiei, Kematronic anunță realizarea noii nanotehnologii, combinație a 2 nanotehnologii: NANO-BIOGAS și NANO-TERMO.

În ambele nanotehnologii se aplică economia circulară, această asigurând:

- A. Creșterea producției de biogaz cu 25- 74% în fermentatoarele existente sau noi ca urmare a injectiei de CO₂ recuperat din gazele arse de la cogenerare în namolul îngrosat înainte de fermentare, și transformarea acestuia în nanobule de CO₂ în lichid
- B. Creșterea producției de biogaz rezultă ca urmare a majorării raportului C/N în timpul fermentării. Scopul este realizarea raportului C/N de circa 30/1- raportul optim pentru creșterea randamentului de fermentare respectiv creșterea randamentului de descompunere a substanței organice și NH₄
- C. Eliminarea completă a nămolului biologic prin post-tratarea nămolului fermentat cu nanotehnologia NANO-TERMO într-un reactor separat, nanotehnologie care realizează tratarea termică (hidroliza termică) timp de 24-36 ore la temperatura de 70°C. Căldura necesară se asigură prin recircularea energiei termice a gazelor arse din instalațiile de cogenerare sau din centrala termică

Câteva calcule și avantaje

Randamentul de descompunere a substanței organice convențional este de 45%. Prin creșterea randamentului cu 74%, randamentul final este de circa 76,5%. Diferența de nămol rămas nedescompus este 23,5%. Prin postratarea nămolului fermentat cu NANO-TERMO în 24 - 36 de ore se reduce substanța organică până la 40%. Rezultă descompunerea completă a substanței organice.

În consecința soluției propuse de Kematronic asigură :

- a) Reducerea costurilor de epurare și a consumului de energie electrică pentru nămolul biologic cu 74%
- b) Decarbonatarea completă a treptei de tratare nămol
- c) Creșterea producției de energie electrică și termică cu 74% . Căldura necesară pentru NANO-TERMO se obține din energia termică produsă de grupurile de cogenerare. Prin captarea și stocarea CO₂ din gazele arse și transformarea lor în nanobule de CO₂ (CCS), se obțin certificate de CO₂ conform regulamentului CE. Certificatele de CO₂ se obțin de asemenea suplimentar prin utilizarea nanobulelor de CO₂ pentru creșterea producției de biogaz CCSU. Se aplică economia circulară cu efecte economice pentru colectarea, captarea, stocarea CO₂ din gazele arse și recircularea energiei termice din gazele arse pentru nanotehnologia NANO-TERMO. Nămolul mineral din efluentul NANO-TERMO, rămas după descompunerea substanțelor organice poate fi transformat în fertilizant organic verde în stare solidă într-o instalație suplimentară bazată pe nanotehnologia NANO- BIO. Fertilizații organici rezultati sunt sub formă de nanoparticule de nutrienți (azot carbon fosfor potasiu) și oligoelemente și pot fi comercializați ușor în cadrul programelor Carbon Farming ale Comunității Europene, program care promovează utilizarea carbonului în agricultură.
- d) Se obțin economii de costuri de operare prin micșorarea substanțială a treptei de nitrificare -denitrificare a apelor de nămol cu NH₄ rezultate din fermentarea convențională
- e) Gazele arse pot fi răcite de asemenea prin recircularea în bazinele cu nămol îngroșat înaintea fermentării , rezultând o preîncălzire a acestuia (tot economie circulară)
- f) Aceste nanotehnologii se pot aplica și la stații de epurare mijlocii, existente sau noi, cu sau fără fermentare

PARTEA IV

Nanotehnologia -soluție pentru producția de nanoparticule de carbon sub formă de grafene în nanofluid apa super critică

Nanotehnologiile NANOSUPERCRITIC și NANO BIOGAZ ale Kematronic se bazează pe producția de nanobule de cavitație și fără cavitație în lichid. provocate de undele ultrasonice.

Implozia nanobulelor de cavitație și fără cavitație generează apa supercritică cu nanobule de aer și CO₂, cu temperaturi de 2000 de grade Celsius și presiuni 1000 bar

În apa supercritică acționează câmpurile electromagnetice (termice), câmpurile electrice și câmpurile ultrasonice.

Se creează plasmă rece și raze ultraviolete UV.

Implozia nanobulelor determină transformarea în gaze a substanțelor organice, în vapori a metalelor și nemetalelor în nanofluid

Procesul de depunere sonochimică în faza de vapori generează nanoparticule de nutrienți esențiali, oligoelemente, metale și nemetale

În cazul CO₂: în prima fază acesta se descompune în carbon și O₂, apoi prin CCS se transformă în nanobule de carbon și recirculă

Prin depunere sonochimică în faza de de vapori se creează nanoparticule de carbon sub formă de graphene .

Această nouă nanotehnologie permite astfel ca namolul din stațiile de epurare, deșeurile agricole, dejecțiile de animale, în general toate deșeurile bogate în carbon să devină graphene - sursă de carbon pentru agricultură și pentru industria electronică.

Apele uzate menajere din România conțin, aproximativ **328.500 tone de carbon pe an**, transformabil în NANOBIOFERTILIZER și GRAPHENE.

ECONOMIE CIRCULARA cu NANO - BIO "NANO - BIO"

