FIT-4-NMP

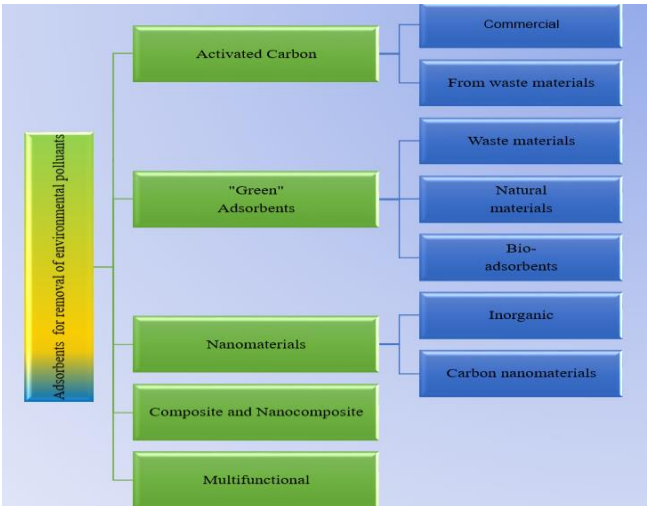
Strategic and targeted support to incentivise talented newcomers to NMP projects under Horizon Europe

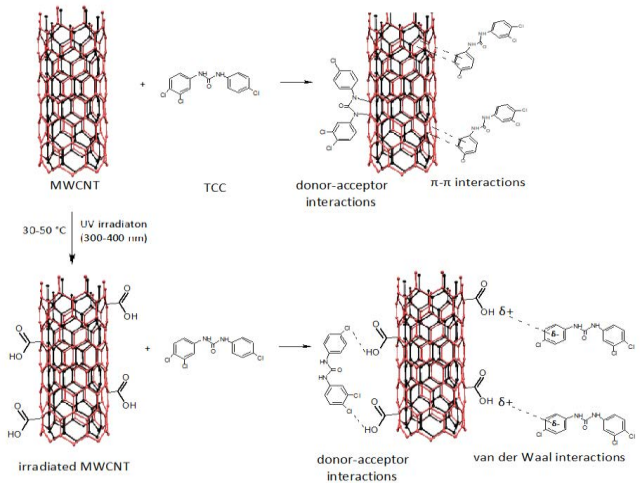
Expertise and Expressions of interest of ROMANIAN TALENTED NEWCOMER ORGANISATIONS for participating in HORIZON EUROPE

National Institute for R&D in Microtechnologies
IMT Bucharest

Carbon-based materials applied in environmental treatment of natural waters

Carbon nanomaterials gained in the last decade high importance as adsorbents in the treatment of natural waters, based on their physical, chemical and morphological properties. Carbon nanomaterials can be much more effective adsorbents in comparison with activated carbon, due to their higher available surface area, more efficient regeneration and more creative design possibilities in order to confer them good selectivity and even specificity. Further studies will help to decrease the costs, especially at pilot scale. The effectiveness of these adsorbents can be evaluated based on the performances and their simple and efficient regeneration.





Sorption conditions at 25 ^{0}C	;			Freundlich		
	K_L, L/mg	q_m, mg/g	R^2	K_F	n	R^2
MWCNT pristine in water	0.0713	59.71	0.9891	9.08	0.4557	0,9756
MWCNT pristine in 10 mg/L HA	0.0494	61.06	0,9875	6.86	0.4662	0,9167
MWCNT pristine in 50 mg/L HA	0.0217	64.68	0,9330	3.20	0.5917	0,9791
MWCNT irradiated in water	0.0365	39.97	0.9655	12.24	0.3325	0,9620
MWCNT irradiated in 10 mg/L HA	0.0530	42.21	0.8971	5.93	0.4267	0,9740
MWCNT irradiated in 50 mg/L HA	0.0692	49.13	0,9876	6.08	0.4959	0,9790

Department of Analytical Chemistry and Enviromental Engineering; Research group: Prof. dr. Ion Ion;
Prof. dr. eng. Alina C. Ion; Dr. Luminita Barbu;
PhD students: Monica Mincu; Roxana Cornoiu; Tudorita Tofan
Research directions: Enviromental analytical applications of carbon-based nanomaterials

Organisation: UPB, Country: Romania
Address: Polizu street no. 1-7, Bucharest
Contact details: efd@upb.ro
Name: Alina Catrinel Ion
Email: alina.ion@upb.ro

Reference of Call/ topic of interest.
Potential contribution/ main ideas
- Water monitoring and treatment, nanomaterials for water, gas, food monitoring sensors (missions, M-ERA.NET, HEU calls)

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Materials for Advanced Wastewater Treatment

Developing VIS-active photocatalytic thin films

Tertiary wastewater treatment for removal of traces (ppm range) of organic wastes in water:
- **process(es) activated by solar radiation**
- **Process(es) that don not leave toxic waste and do not use toxic reactants**

→ HETEROGENEUS PHOTOCATALYSIS

n-n tandem systems
TiO_2/SnO_2, Efficiency > 91%

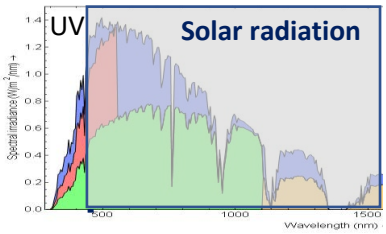
Enesca A., Isac L., Andronic L., Perniu D., Duta A., Appl. Cat. B, 2014, 147, 175 - 184

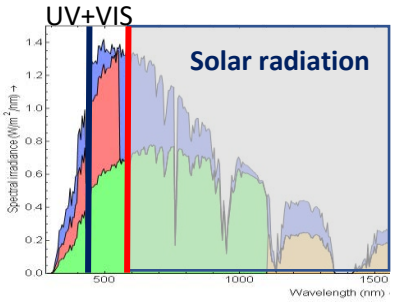
n-p diode type systems
TiO_2/Cu_2ZnSnS_4, Efficiency > 85%
Leaching!!!

Bogatu C., Covei M., Tismanar I., Perniu D., Duta A Advanced Nanostructures for Environmental Healt Micro and Nano Technologies, 2020, 431-463.

$MetO_x$ matrix with C derivative filler
TiO_2/GO (rGO, g-C_3N_4)

Tismanar I., Obreja A.C., Buiu O., Duta A., Appl. Surf. Sci. 538, 2021, 147833





Thin film deposition
- Spray Pyrolysis and Cold Deposition equipment
- Sol-gel method: spraying the sol

Thin film characterization
- XRD, SEM, EDX, water CA, BET surface, UV-VIS-NIR spectroscopy, IR spectroscopy, AAS

Thin film testing
- Climatic chamber
- Continuous flow demonstrator photocatalytic reactors (for thin film and powder)

Short description of the *Renewable Energy Systems and Recycling* - our members:

Anca Duta, Cristina Bogatu, Dana Perniu, Maria Covei, Luminita Isac, Ioana Tismanar, Silvioara Gheorghita

Transilvania University of Brasov, Romania
Eroilor Bd., no. 29, Brasov, Romania

Contact details:
Name: Maria Covei
Email: maria.covei@unitbv.ro
Telephone: 0040726311063
Website: https://icdt.unitbv.ro/en/research-centres/renewable-energy-systems-and-recycling.html

Potential contribution/ main ideas:
- **Development of novel VIS/solar photocatalytic metallic oxides;**
- **Structural, morphological, optical, electrical, characterization of different novel materials, particularly metal oxides;**
- **Testing of novel photocatalytic materials at laboratory and demonstrator scale, home-made reactors.**

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Innovative solutions for Industry 5.0 technologies

The EC defined six categories of technology expected to provide catalysts for Industry 5.0. The first three categories are already fully embedded into the current Industry 4.0 paradigms.
SIS has developed solutions based on these technologies under R&D projects but also in response to ongoing customer requirements.

EC's six categories of technology	SIS's project
Digital twins and simulation	SMARTech uses MATLAB and Simulink to build digital twin in smart microgrids
Data transmission, storage, and analysis technologies	Smart microgrid Controller project is already implemented in Monsson microgrid,
Machine learning and AI technologies	Technologies used in Prevention project
Human-machine interaction	In various R&D projects and industrial applications are developed human machine interfaces both for operation, maintenance and development
Bio-inspired technologies and smart materials	
Technologies for energy efficiency, renewables, storage.	

Short description of Organization/Laboratory/Department:

SIS SA is an innovative SMEs, a system integrator operating in the field of industrial automation for oil and gas, cement, renewable energy, microgrids, power transmission and distribution, water management. SIS has experience in process operation and control, risk and hazard control, asset management, IIoT, industrial operator training procedures, process modelling and identification, and human-machine interfaces.
SIS SA was involved in R&D projects covering various fields from advanced manufacturing- smart sensors and actuators, IoT, IIoT, signal and image processing, wearables, communication technologies, data acquisition, safety instrumentation, asset instrumentation, biomedical devices, remote monitoring, e-learning. The R&D activity of SIS has as main objective facilitating the adoption of new digital technologies in different sectors, mainly addressed to process control and automation systems.

Organisation: Societatea de Inginerie Sisteme SIS,
Country: Romania;
Address: 22th Electronicii street, Bucharest
Contact details:
Name: Gheorghe FLOREA
Email: gelu.florea@sis.ro
Telephone: +4021/2525577

Reference of Call/ topic of interest.
Potential contribution/ main ideas:
Instrumentation, process control, safety and security solutions, operational technology expertise can join any consortium that develops a competitive proposal,

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Magnetic Additive Manufacturing

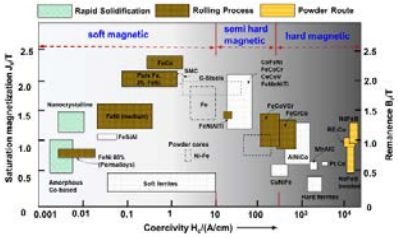
Short description of topic (scientific description)

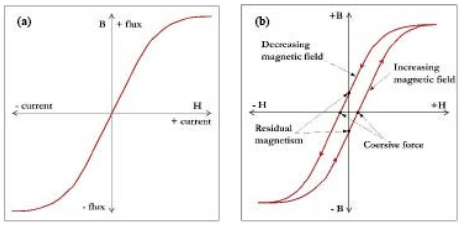
In recent years, Additive Manufacturing (AM), also called 3D printing, has been expanding into several industrial sectors due to the technology providing opportunities in terms of improved functionality, productivity, and competitiveness. While metal AM technologies have almost unlimited potential, and the range of applications has increased in recent years, industries have faced challenges in the adoption of these technologies and coping with a turbulent market. Despite the extensive work that has been completed on the properties of metal AM materials, there is still a need of a robust understanding of processes, challenges, application-specific needs, and considerations associated with these technologies.

Magnetic composite materials have gained more attention in recent years. Composite magnetic materials are especially attractive to manufacturers of small motors and actuators for household and automotive use as well as to the audio, video, and computer industries. These magnets fall into two categories such as soft and hard composites.

•Soft magnetic composites usually iron-based, are obtained by pressing soft magnetic powder with a dielectric binder.
•Hard magnetic composites usually Nd-Fe-B, are obtained by bonding hard magnetic powder with a dielectric binder.

Magnetic composites are an essential technology for energy conversion and are desirable to be obtained from AM processes. These magnets must be pre-charged prior to their use in an application and must maintain this magnetization during an intended operation. Additionally, permanent magnets must generate the required magnetic flux for a given application. Therefore, understanding the magnetic properties of AM-fabricated magnets is essential.





Short description of Organization/Laboratory/Department:

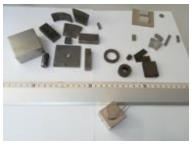
The Magnetic Materials Laboratory has extensive experience in the research of hard and soft magnetic alloys obtained in cast, melt-spun ribbons, microwires and thin film forms experimentally developed for various applications. Besides research the department has experience also in $Nd_2Fe_{14}B$ and Alnico magnets production.

Main areas:

I) Hard magnetic materials

•Researches for Reducing Deficient Elements (Rare Earths, Co, etc.)
•Improving the magnetic properties of classical magnets by structural changes
•New magnets with spin interaction
•Emerging technologies for recovery of magnet from waste WEEE applications of hard magnetic materials



II) Soft magnetic materials

•RDI for new magnetic micro / nanostructure materials or amorphous alloys
•RDI for new soft magnetic micro / nano powders materials usable in additive manufacturing
•Soft magnetic materials applications

Organisation: INCDIE ICPE-CA, Country:Romania
Address:Splaiul Unirii, 313
Contact details:
Name: Manta Eugen
Email: eugen.manta@icpe-ca.ro
Telephone:+40721033583

Reference of Call/ topic of interest.
Potential contribution/ main ideas
Advance Materials: Materials for additive manufacturing

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Nanoparticles and thin films of ZnO and ZnO doped with metal ions

Short description of topic (scientific description)

Our research group has conducted research to obtain room temperature ferromagnetism of dilute magnetic semiconductors (DMS). Thus we have synthesized ZnO doped transition metals (Fe, Ni, Co, Mn) by the sol-gel method in the form of thin films and nano powders.

These were characterized from the structural point of view (XRD), the surface morphology (AFM) and magnetic properties (VSM).

Fig.1. AFM micrographs of thin film surface for (a) $Zn_{0.97}Ni_{0.03}O$ and (b)$Zn_{0.97}Fe_{0.03}O$.

Another direction of research addressed the study of the antibacterial and antifungal properties of ZnO nanoparticles and ZnO doped with metal ions. Nano powders of undoped nanostructured ZnO and ZnO doped with metal ions (Mn, Ag) were synthesized by sol-gel method and characterized regarding the structural (XRD, FT-IR), morphological and dimensional (SEM), optic (UV-Vis) and the specific surface (BET method) properties.

Short description of Organization/Laboratory/Department:

The Magnetic Materials Laboratory has extensive experience in the research of hard and soft magnetic alloys obtained in cast, melt-spun ribbons, microwires and thin film forms experimentally developed for various applications. Besides research the department has experience also in $Nd_2Fe_{14}B$ and Alnico magnets production.

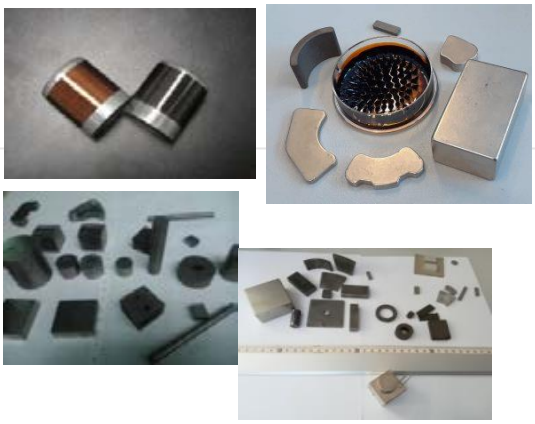
Main areas:

I) Hard magnetic materials

- Researches for Reducing Deficient Elements (Rare Earths, Co, etc.)
- Improving the magnetic properties of classical magnets by structural changes
- New magnets with spin interaction
- Emerging technologies for recovery of magnet from waste WEEE applications of hard magnetic materials

II) Soft magnetic materials

- RDI for new magnetic micro / nanostructure materials or amorphous alloys
- RDI for new soft magnetic micro / nano powders materials usable in additive manufacturing
- Soft magnetic materials applications



Organisation: INCDIE ICPE-CA, Country:Romania
Address:Splaiul Unirii, 313
Contact details:
Name: Manta Eugen
Email: eugen.manta@icpe-ca.ro
Telephone:+40721033583

Reference of Call/ topic of interest.
Potential contribution/ main ideas

Advanced materials / Manufacturing technologies

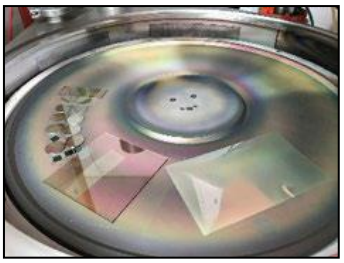
FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

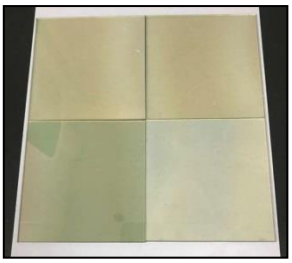
Multifunctional transparent conductive thin layers

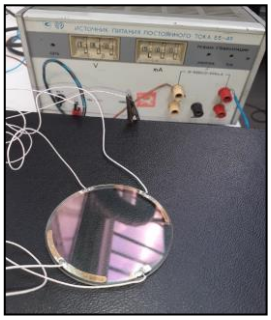
Short description of topic (scientific description)

"High optical transparency thin films obtained by vacuum deposition of conductive oxides for anti-static applications and broadband protection against electromagnetic interference-THINSAFE", 7PTE/2020, 2020-2022. Partners: MGM STAR Construct, INCDIE ICPE-CA, INOE-2000. **Project objective:** Increasing the competitiveness of SC MGM STAR CONSTRUCT SRL Bucharest by assimilating the RDI results of INCDIE ICPE-CA for the innovative development of anti-static and broadband protection against electromagnetic interference using transparent conductive thin layers.

Results: Development of a technology for transparent conductive thin layer structures manufacturing with thicknesses of max. 600 nm, with a surface resistance of max. 100 Ω/square for a shielding efficiency of min. 25 dB and for anti-static effect with a max. surface resistance of 1000 Ω /square, on flexible and rigid transparent substrates for visible transmittances of at least 80%.







"Transparent conductive layers for obtaining radiant or thermally reflective thermal elements based on transparent conductive layers", Competitiveness Operational Program, subsidiary POC 133-D3MGM/2018.
Partners: INCDIE ICPE-CA, MGM STAR Construct.
Project objective: Production of thermally radiating elements of the AZO type and thermally reflective elements of the ITO type.

"Innovative technologies for physical vacuum deposition based on thin, multifunctional, nanostructured layers intended for large parts – LargCoat", Innovative technological project for less developed regions POC-PTI no. 262/18.06.2020.
Partners: MGM STAR Construct, INCDIE ICPE-CA, POLITEHNICA University of Bucharest.

Short description of Organization/Laboratory/Department:

In August 2004 based on the decision HG no. 1282 of the Romanian Government published on Official Monitor no. 775/24.08.2004 has been founded the National R&D Institute for Electrical Engineering ICPE-CA Bucharest. This institute, with a high scientific and professional reputation, carries out: research, development, small-scale manufacturing and service activities especially in the field of electrical engineering technologies, materials, and other related fields of activity.
The Carbon Materials Laboratory has over the 40 years of research experience in carbon materials for applications in the electrical engineering industry. The vision is to 'tailor' new carbon materials and composites, based on a sound scientific footing and then extend the range of materials and applications by using the developments in nano-structured materials.

Organisation: National Institute for Research and Development in Electrical Engineering ICPE-CA Bucharest, Romania
Address: 313 Splaiul Unirii, Bucharest - 3
Contact details:
Name: Iulian Iordache
Email: iulian.iordache@icpe-ca.ro
Telephone: +40752078694

Reference of Call/ topic of interest.
- Research & Innovation Actions, Coordination & Support Actions / Advanced Materials Domain (Material Surfaces, Coatings and Interfaces, Functional Materials, Materials for Energy)

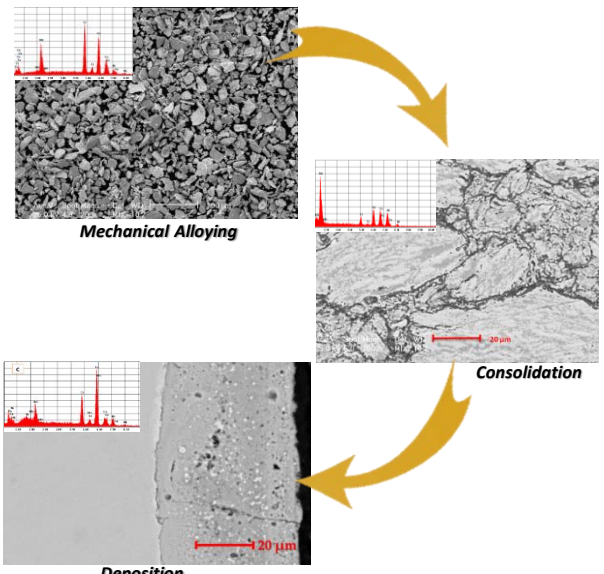
Potential contribution/ main ideas
- Materials development (multifunctional transparent conductive thin layers)
- Materials characterization

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Multicomponent alloys with corrosion-erosion resistance

Short description: High-entropy alloys could provide a solution for the aggressive environments due to their impressive properties. In previous research, solid-state processing of high purity Co, Cr, Fe, Ni and Mo metallic powders were deposited on stainless steel and the results were promising. CoCrFeNiMo base high entropy alloys tested in corrosive media in situ (geothermal environment) and in the laboratory (saline solution), presented a very good corrosion rate of 0.00016 mm/year.

In order to increase the wear resistance, ceramic particles are added into the mixture, developing composite materials with superior properties for a large spectrum of domains and industries. The alloys could be tailored depending on the final destination, with specific properties, resulting in wide range of application.



Corrosion, erosion, wear and abrasion affected surfaces

Ceramic Materials Laboratory is part of **Carbo-Ceramic Department** from the **National Institute for R&D in Electrical Engineering ICPE-CA Bucharest.**

The main research directions are:

- Development of research in the field of ceramic materials and components for electrical engineering
- Development of research in the field of ceramic materials and components for energy
- Development of research in the field of ceramic materials for the decontamination / purification of polluting waters
- Development of research in the field of biomaterial ceramics
- Development of research in ceramic materials for space, security, defense

Organisation: National Institute for R&D in Electrical Engineering ICPE-CA Bucharest
Country: Romania
Address: Splaiul Unirii 313, Bucharest 030138
Contact details:
Name: Laura Elena GEAMBAZU
Email: laura.geambazu@icpe-ca.ro
Telephone: +04724157091

The aim is to develop materials resistant to aggressive environments, where corrosion, abrasion, wear and scaling are affecting the in work components. Coating surfaces with high entropy alloys and high entropy alloy composites is an economic efficient method of extending the life of the equipment while improving the properties. Our goal is to establish connections with partners from industries, where damaging factors caused by the aggressive environment have an important impact over functionality.

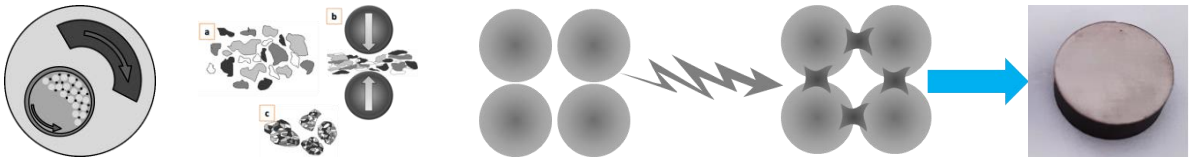
Advanced materials/Manufacturing technologies

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

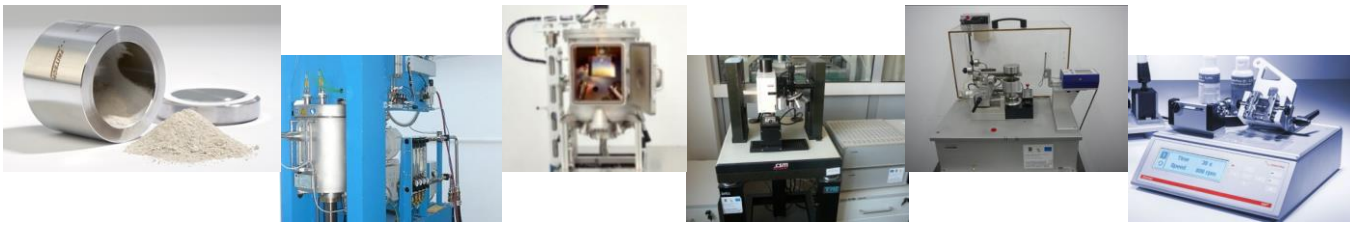
High Entropy Alloys Functional Coatings (corrosion/wear resistant) - HEA-FC

Short description: The implementation of the project will lead to the acquisition and consolidation of new technical knowledge of the research teams in the field of high entropy alloys and of functional coatings with the role of protection against the effects of corrosion and wear.

The project's novelty consists in the development of new materials with specific corrosion/wear resistance properties for high temperature structural and functional applications in industries such as space, nuclear and energy. Due to their complex nature, HEAs can be easily modified to ensure optimal properties. The novelty element represents the identification of the best deposition techniques in order to achieve superficial layers with high corrosion/wear resistance properties as well as the specific deposition parameters. This type of alloys can have clearly superior predetermined properties represented by the summation of the properties of the constituent elements. The adjustment of certain properties is achieved by changes in the chemical composition, microstructure or processing method of the material. For economic reasons, a possible use in the industrial environment of high-entropy alloys is represented by the coating of components working in environments where wear, erosion or corrosion are present at an accelerated rate, thus promoting HEA to extend the life of in work equipment.



Short description of LABORATORY OF METALLIC MATERIALS (LMMet): Elaboration of micro/nano metallic materials and composites through eco-nano/micro technologies, emerging technologies, powder metallurgy (PM) , spark plasma sintering (SPS), magnetron sputtering and their characterization (Nano/Micro indentation, Tribometer, Calotest).



https://eeris.eu/ERIF-2100-000T-7855

Organisation INCDIE ICPE-CA**, Country:** Romania
Address: Splaiul Unirii 313, District 3, Bucharest
Contact details:
Name: Manea Ciprian Alexandru
Email: ciprian.manea@icpe-ca.ro
Telephone: +40731349727

The main interest is to attract partners with different deposition methods (LMD, MAPLE, PLD) and/or in-situ testing possibilities.
The novelty elements will generate the diversification of the partner company's product portfolio and the expansion of its market. Topic of interest: Advanced materials/Manufacturing Technologies.

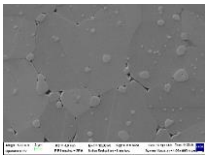
FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

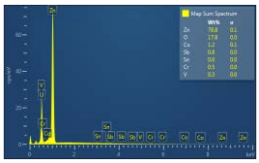
Development of disc-shaped metal oxide varistors (MOVs) containing ZnO and/or TiO_2 semiconductors and various MO dopants for low, medium or high voltage applications

Short description of topic (scientific description)

Background: MOVs based on ZnO, SnO_2, or TiO_2 semiconductors are voltage-dependent resistors composed of a dense and conductive matrix of $ZnO/SnO_2/TiO_2$ grains (majoritary phase) with adjacent resistive grain boundaries (GBs) of a mixture of various MO additives. Bi_2O_3, V_2O_5 and Pr_6O_{11} are varistor forming oxides (VFOs), while MOs like MnO_2, Mn_3O_4, Nb_2O_5, Co_2O_3, Er_2O_3, Y_2O_3, Sm_2O_3, Dy_2O_3, La_2O_3, CeO_2, etc. are used as varistor enhancing dopants (VEDs). The type, content and grain size of the semiconductor matrix and MO dopants, along with the preparation techniques and synthesis conditions of the MOV powders, consolidation techniques, processing parameters, size and shape of MOVs greatly influence the microstructure, technical characteristics and functional behaviour of MOVs during operation in voltage surge protection devices (SPDs) utilized in industrial and consumer electronics and electric power systems to protect them against temporary overvoltages and current surges.

Expertise of ICPE-CA, DMMCP





- ✓ Development of MOV discs based on (i) ZnO doped with V_2O_5, Sb_2O_3, Co_3O_4, SnO_2, and Cr_2O_3 (at TRL 7), and (ii) SnO_2 doped with Bi_2O_3, CuO, NiO, MnO_2, ZrO_2 or Co_3O_4 (at TRL 5) for MV surge arresters.
- ✓ Electrical tests were performed by Maira Montaj SRL within the national R&D Contract no. 327 PED/2020 between INCDIE ICPE-CA (Coordinator) and Maira Montaj SRL (SME partner).

Project proposal / Future works

- ➢ Development of novel formulations of MOV powders and manufacturing by powder metallurgy of disc−shaped MOVs based on ZnO and/or TiO_2 semiconductors and various amounts of micro and/or nanocrystalline MO dopants, including rare element oxides (REOs) for low, medium or high voltage applications.
- ➢ Investigation of MOV powders and discs by XRD, UV-Vis spectroscopy, SEM, EDX, and dielectric behaviour of MOV discs.
- ➢ Envisaged TRL at the project end: TRL 7

Short description of Organization/Laboratory/Department:

The Department of Metallic, Composite, and Polymeric Materials (DMMCP) is composed of **Laboratory of Metallic Materials (LMMet)** and **Laboratory of Radiochemistry and Polymeric Materials (LRMP)**.

The main directions of research, development, and innovation of the LMMet are the followings: ► Industrial research and experimental development of innovative and/or improved metallic and composite advanced materials for applications in priority areas; ► Applied research in the field of advanced materials and components for energy, electrical engineering, special and/or environmental applications; ► Development of interdisciplinary researches in the field of metal surface functionalization and the study of the properties at the interface; ► Eco-nano/micro technologies and emerging technologies for achieving new advanced materials. **The research infrastructure, research services and technological services of the DMMCP** are presented on https://eeris.eu/ERIF-2100-000T-7855

Organisation: National Institute for Research and Development in Electrical Engineering ICPE-CA (INCDIE ICPE-CA) Bucharest,
Country: Romania
Address: 313 Splaiul Unirii, Sector 3, Bucharest
Contact details: Head of DMMCP
Name: Dr. Eng. Magdalena Valentina Lungu
Email: magdalena.lungu@icpe-ca.ro
Telephone: 0040723.686.334

Reference of Call/ topic of interest: advanced materials
Potential contribution/ main ideas:
INCDIE ICPE-CA: development of novel formulations of MOV powders and MOV discs, and investigation of MOVs in terms of structural, optical, mechanical, and dielectric properties
Potential RTD/UNI/SME/IND partners: microstructure modelling by FEM, electrical tests of MOVs (discharge voltage, breakdown voltage (V_B) or breakdown field (E_B) at 1 mA/cm^2, leakage current at 80% of V_B or E_B, high/low-current, short/long-duration discharge, thermal stability test, aging test).

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Composite and nanocomposite materials processed through high-energy gamma irradiation

Short description of topic

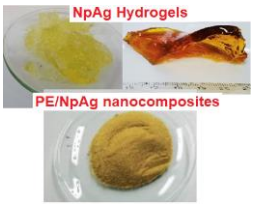
Gamma rays are high-energy electromagnetic radiation used in various applications:

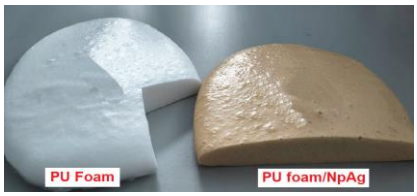
- ❑ sterilization of medical devices and food, radiotherapy, restoration and conservation of art objects;
- ❑ processing of polymeric materials for high performance applications: compatibilization of imiscible polymer blends; radiochemical crosslinking for products with shape memory; obtaining of biodegradable polymer composites;
- ❑ radiochemical synthesis of metallic nanoparticles (Ag, Cu, Au, Fe_3O_4, ZnO, Cu-Au, Pt, Ir, Rh, etc.) with **catalytic** (degradation of dyes, materials for the reduction of heavy metals in wastewater), **medicine** (anticancer therapy, drug delivery, antimicrobial materials), **sensors/biosensors** (determination of organic and inorganic pollutants), **renewable energy sources** (ARC PVC, storage of hydrogen, fuel cells) applications.

Expertise of ICPE-CA, Radiochemistry and Polymeric Materials Laboratory (LRMP)

Heating cables with PTC effect

Cu-Au alloy Nps for professional surface decontamination





Polymeric antimicrobial nanocomposites for biomedical applications: wound dressing, mattresses, catheters, etc.

Short description of LRMP:

The main directions of research, development, and innovation of the LRMP are the followings: ► Processing of polymeric materials by ionizing radiation technologies;► Degradation diagnosis of polymeric materials and lifetime assessment under thermo-, photo- and radiooxidative stress, UV and climatic factors; ► Qualification of some materials for operation in ionizing radiation environments; ► Radiochemical synthesis of some nanostructures (metal nanoparticles and polymer nanocomposites) for various applications; ► Accelerated aging tests (UV, gamma rays) and material characterization through different analysis techniques (FTIR, UV-Vis, Raman, DSC, CL, GC-MS). **The research infrastructure, research services and technological services** are presented on https://eeris.eu/ERIF-2100-000T-7855

Organisation: National Institute for Research and Development in Electrical Engineering ICPE-CA (INCDIE ICPE-CA) Bucharest,
Country: Romania
Address: 313 Splaiul Unirii, Sector 3, Bucharest
Contact details: Head of LRMP
Name: Dr. Eduard-Marius Lungulescu
Email: marius.lungulescu@icpe-ca.ro
Telephone: +40.726772252

Reference of Call/ topic of interest:
- **Advanced Materials**
- **Clean and circular industries**

Potential contribution: The obtaining of high-performance materials (polymers, metal nanoparticles, polymeric nanocomposites) through green technologies (gamma irradiation) for biomedical, sensors, catalysis and renewable energy sources applications

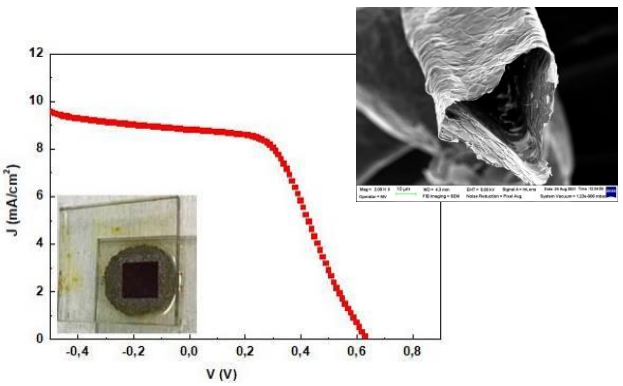
FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

3D Graphene and 3D Graphene Hybrids

Short description of topic (scientific description)

"Dye Sensitized Solar Cells With Integrated 3D GraphEne sTructures - DSSC-WIDGET", 129PED/2017, 2017-2018, Programme 2

- Increase Competitiveness of the Romanian Economy through Research, Development and Innovation.
Partners: INCDIE ICPE-CA BUCHAREST (coordinator), IMT BUCHAREST. **The general objective of the project** was to evaluate the functionality of the 3D graphene structures in optoelectronic devices, specifically in photovoltaic cells (DSSC).
ICPE-CA role: Synthesis of 3D graphene structure on the metal catalyst; Structural and morphological characterization of the 3D graphene structure on the metal catalyst; Removing the metal catalyst from the 3D graphene structure; Functionalization of the 3D graphene structure.
Project results: **Experimental model of DSSC type photovoltaic cell with 3D graphene counter electrode attached to FTO with conductive organic polymer (PEDOT: PSS) with an efficiency of 2.5%.**



Current density variation according to voltage and photographic image of DSSC photovoltaic cell with 3D graphene counter electrode

"CarBon quANtum Dots/graPhene hybrids with broAd photoreSponSivity – BANDPASS", Horizon 2020 ATTRACT Third Party Project Agreement, 2019-2020.
Partners: IMT Bucharest (coordinator), Babes-Bolyai University - Faculty of Chemistry and Chemical Engineering, INCDTIM, INCDIE ICPE-CA.
The aims of the project were: Development of flexible graphene-based photodetectors (PD) with broad responsivity by exploring several strategies to synthesize graphene-based materials: (i) colloidal carbon quantum dots (CQD) with broad absorption; (ii) reduced graphene oxide with various degree of reduction (RGO) as well as their chemical doping (N-RGO); (iii) foam-like 3D graphene (GF) structures by thermal CVD. 3D graphene foam with a large surface area and excellent transport properties was chemically synthesized from methane at ICPE-CA.

Short description of Organization/Laboratory/Department:

In August 2004 based on the decision HG no. 1282 of the Romanian Government published on Official Monitor no. 775/24.08.2004 has been founded the National R&D Institute for Electrical Engineering ICPE-CA Bucharest. This institute, with a high scientific and professional reputation, carries out: research, development, small-scale manufacturing and service activities especially in the field of electrical engineering technologies, materials, and other related fields of activity.
The Carbon Materials Laboratory has over the 40 years of research experience in carbon materials for applications in the electrical engineering industry. The vision is to 'tailor' new carbon materials and composites, based on a sound scientific footing and then extend the range of materials and applications by using the developments in nano-structured materials.

Organisation: National Institute for Research and Development in Electrical Engineering ICPE-CA Bucharest, Romania
Address: 313 Splaiul Unirii, Bucharest - 3
Contact details:
Name: Cristina Banciu
Email: cristina.banciu@icpe-ca.ro
Telephone: +40745046988

Reference of Call/ topic of interest.
- Research & Innovation Actions, Coordination & Support Actions / Advanced Materials Domain (Functional Materials, Graphene, Materials for Energy)

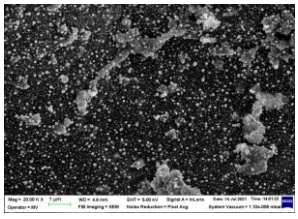
Potential contribution/ main ideas
- Materials development (3D graphene or its hybrids for using as electrode in different energy devices)
- Materials characterization

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

Microwave Absorber Composites Structures Based on Ferromagnetics - Graphene Derivatives, with Heat Dissipation Capabilities

Scientific description

With the explosive progress in telecommunications and electronic interfaces, the effects of dangerous electromagnetic interferences can no longer be excluded. The electromagnetic pollution has launched an increase of researches on possible consequences and remedies, in order to identify, design and produce new materials and composite systems for electromagnetic shielding. The proposal idea appears as answer to the **necessity to identify and develop new composite structures** that improve the operating, by eliminating interference and allow the radiation level reduction, by absorption. For example, whereas military electronics used to operate in a narrow band of frequencies, today, military design engineers must protect equipment from damaging signal interference and enemy detection at a wider range of frequencies than ever before including radar at frequencies as low as 100 MHz and as high as 95 GHz. The **microwave absorbing materials** plays an increasing **significant role in national defence security, health, electronics reliability**. The project proposes **an improved composite media for microwave absorption**, formed by heterostructures, including ferromagnetic constituents, consisting of metallic nanoparticles as $FeNi_3$, FeCo or FeNiCo and dielectric components, on the one hand, a reduced graphene oxide network, in which the ferromagnetic nanoparticles are fixed, on **the other hand a polymer, activated** with components that assure the heat dissipation.



ICPE-CA has developed **composites** based on graphene derivatives decorated with Fe/Fe_2O_3, $FeNi_3$ or FeCo nanoparticles, reaching a level for effectiveness of electromagnetic shielding $\mathbf{SE_{dB}}$ **of 120 – 130 dB** at **frequency of GHz order**.

SEM image of the FeCo nanoparticles grafted on graphene derivatives (x 20000)

Short description of Magnetic Materials Laboratory:

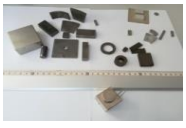
The Magnetic Materials lab has extensive experience on research of hard and soft magnetic materials, prepared as cast, melt-spun ribbons, glass-coated microwires and thin films, and also on design and development of various applications including these materials. Besides research, the lab has expertise also on production of NdFeB and Alnico magnets.

Main areas of interest:

a) Hard magnetic materials

- researches for reducing critical elements (rare earths, cobalt) in magnetic materials;
- improvement of magnetic properties of classical magnets by structural changes;
- development of new magnets with spin interaction;
- emerging technologies for recovery of magnet from WEEE; applications of hard magnetic materials.

b) Soft magnetic materials



- development of new magnetic micro / nanostructure materials or amorphous alloys;
- preparation of novel soft magnetic micro / nanopowders material, for additive manufactur
- applications of soft magnetic materials.

Organisation: INCDIE ICPE-CA Country: Romania
Address: 313 Splaiul Unirii, Bucharest - 3

Contact details:
Name: Mirela Maria Codescu
Email: mirela.codescu@icpe-ca.ro
Telephone:+40 755015605

Reference of Call/ topic of interest.
- Advanced materials / Manufacturing technologies
Potential contribution/ main ideas

- **Complex characterization of materials behavior in high frequency;**
- **Development and production of microwave absorbers based on the novel materials.**

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

FIT-4-NMP

NANOM MEMS SRL
Working today with tomorrow's technologies

NANOM MEMS SRL - PROJECTS AND ACHIEVEMENTS - NEW RESEARCH OPPORTUNITIES

Projects:

NANOM MEMS srl –INCD FM Joint Research Project, **-"Multifunctional Intelligent Materials for High Tech Applications"** 2018-2021

Valorificarea unor noi tinte terapeutice in boala Alzheimer si patologii neurodegenerative asociate "
Contract Eureka nr. 63/ 2018 2018-2024

VOC-DETECT- "Smart Portable System for VOCs detection

M-era.Net
Ctr.112/2019

NANO-EH Project

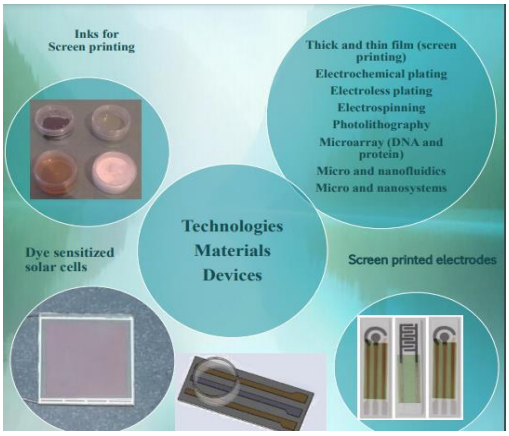
"PHEMTRONICS" **- a H2020 FETO PEN Project** (2020-2023)

"Capitalization of magnetic nanoparticles in the development of a micro-magnetic device",
Contract No. 522PED/2020 - 2020-2022

Platformă analitică microfluidică nanostructurată pentru detecția dual SERS-electrochimică a unor poluanți emergenți ai mediului POLSENS
Contr. RO-NO Nr. 32/2020 - 2020-2023

TECHNOLOGIES
- **Thick and thin film (screen printing and inkjet printing)**
- **Electrochemical plating**
- **Electroless plating**
- **Electrospinning**
- **Photolithography**
- **Microarray (DNA and protein)**
- **Micro and nanofluidics**
- **Digital microfluidics**
- **Micro and nanosystems**
- **Supercritical fluid processing**
- **Laser processing**
- **Hybrid integration**

MATERIALS
- Thick and thin film inks
- Ceramic components
- Metallic powders
- Carbon components
- Conducting polymers
- Micro and nanofibers
- Organic/inorganic and Biochemical compounds



DEVICES
- DS solar cells
- Screen printed electrodes
- Sensors and biosensors
- MEMS and BioMEMS

NANOM MEMS SRL, Romania
Str. G. Cosbuc 9
Rasnov 505400, Jud. Brasov

Contact details:
Marin Gheorghe
Email: maringhe@nanom-mems.com
Telephone: +40763342065

Reference of Call/ topic of interest:
New materials, technologies and devices
Potential contribution/ main ideas:
- Complete experience of research, new materials and process development to scale production of passive and active microdevices fabrication
- Fast transition from IP review and technology radar to novel concept development.

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

A non-invasive reusable saliva glucose amperometric sensor with capabilities towards wearable devices

Short Description

A robust and reusable amperometric sensor for the continuous and sensitive detection of glucose for in vitro samples of human saliva has been developed using a POC system. The amperometric sensors can detect glucose in saliva samples with high accuracy comparative with samples tested with the ELISA commercials kits. Moreover, they have the capability to be reused after a simple drying process and can be used for continuous salivary glucose monitoring. The proposed sensor assures the continuous measurement of glucose in a range of 0 to 33000 µM and is compatible with commercially available miniaturized potentiostats for point-of-care in vitro detection. Our studies also bring new contributions regarding the correlation between glucose in human saliva samples and human blood samples.

Similar sensors do not exist on the medical market so a big challenge is going to be the fabrication of the device and acquiring the necessary samples for its complete testing on biological probes from patients (saliva) versus blood tests (”golden standard”)

Technical goals

- Development and optimization of the technology process for the fabrication of the proposed chips.
- Development of a reusable, biocompatible, stable and sensitive glucose layer for a wide range of glucose concentrations in saliva samples from low saliva concentrations <10 µM/L to high concentrations up to 30 mM/L.
- Optimization of the technology for a reproducible sensitive layer using a controllable process for its fabrication: electrochemical deposition and drop casting deposition.

Organization

The National Institute for Research and Development in Microtechnologies (IMT Bucharest) is a public non-budgetary institute established in 1996. Its activity covers research and development in the field of micro- and nano- technology, nanomaterial characterisation and technology transfer, with sensors being developed for use in medical diagnostics, pharmaceuticals, in vitro and in-vivo measurements.

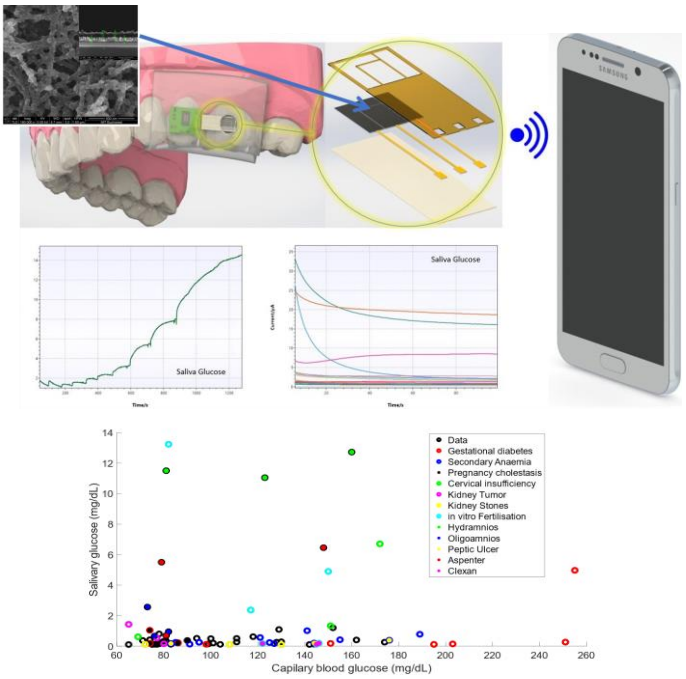


Fig.1: Representation of the measured datapoints as a function of the capillary blood and salivary glucose. Colours were employed to mark the datapoints collected following a specific treatment in addition to testing the intolerance for glucose or from patients affected by specific conditions such as diabetes or anaemia.

Fig.2 Chips are developed via lithography on a ceramic substrate

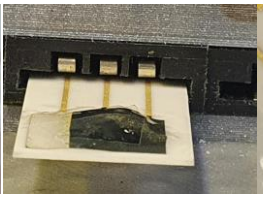


Fig.3. Enzymatic layer after reaction with glucose

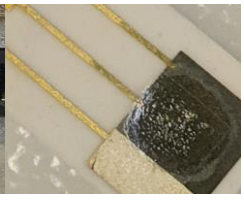


Fig.4. Sensitive and biocompatible layer after drying process

Organisation National Institute for Research and Development in Microtechnologies**, Romania**
Contact details:
Name:
Carmen-Marinela Mihailescu
Email:
carmen.mihailescu@imt.ro
Telephone:

Partners:

- Carol Davila University of Medicine and Pharmacy
- Clinical Hospital Dr. Ion Cantacuzino

FIT-4NMP received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 958255

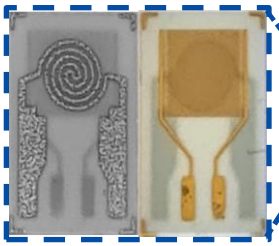
Sensors and Smart Systems for Pollutant and Hazardous Gases

Short description

A multisensory array is proposed for the detection of gases in three main areas: environmental monitoring, with the target being pollutants such as CO_x, NH_3, CH_4 and NO_x; indoor air quality monitoring, with the target being the detection of VOCs such as CH_2O and C_6H_6; and the detection of explosives (TNT and RDX). An array of sensors dedicated to each targeted gas is proposed such that the constituent sensors can be mixed and matched based on the addressed problem. Thus, a series of sensors based on metallic oxides and including a heater patterned on the back of the chip are developed for the environmental and indoor gases. Sensors based on graphene oxide and polyaniline are also tested a potentially complimentary sensors. To address the high cross sensitivity issues of such sensors an algorithmic correction algorithm is proposed, which determines the range of each gas present in the environment based on the calibration of the sensors to each gas.

Organisation

Romelgen was established in 2000 and has had as its goal the distribution and technological support of a range of temperature control device and gas measurement components.

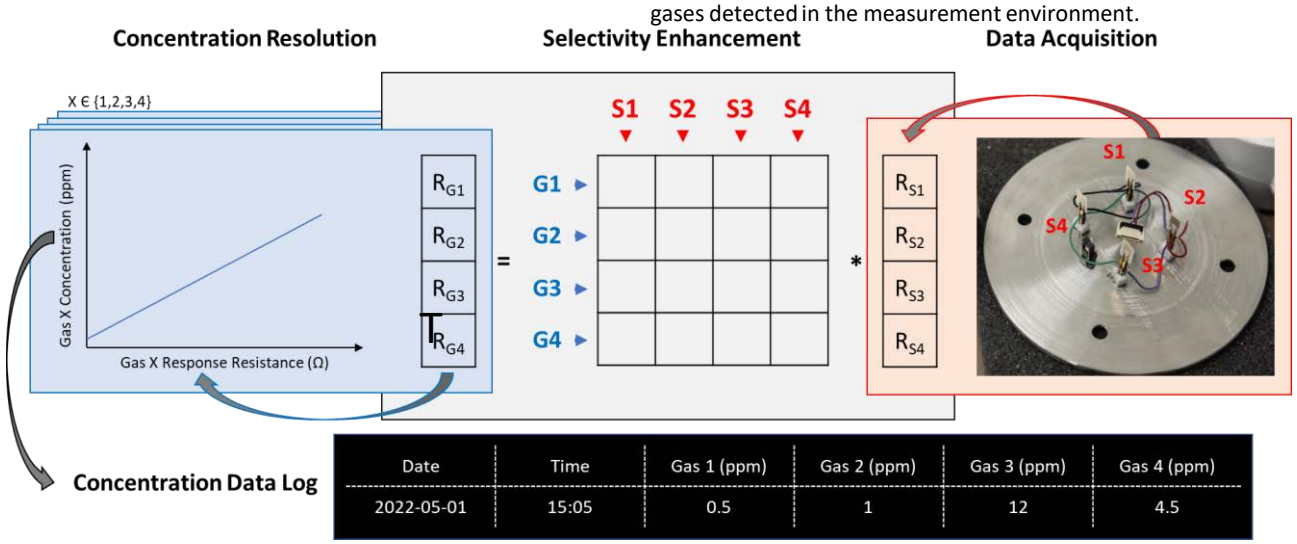


Heater: on sensor back

Sensing area: on sensor front

Data Acquisition

Data acquisition is performed continuously and transmitted to a readout platform (e.g. smartphone). On receiving data from four sensors with specific selectivity to different families of gases (e.g. NH_3, NO_2, CO and CH_2O), the results are sent through a selectivity enhancement matrix. This compares the resistances to those obtained by the sensor to set combinations of the four gasses and on comparing with the calibration curves of the sensors, it gives a readout for the gases detected in the measurement environment.



Date	Time	Gas 1 (ppm)	Gas 2 (ppm)	Gas 3 (ppm)	Gas 4 (ppm)
2022-05-01	15:05	0.5	1	12	4.5

Organisation Romelgen S.R.L. Bucharest, Romania

Contact details:

Name:
Ion Stan
Email:
stan.ion2007@yahoo.com
Telephone:
+40722 262 118

Partners:

- National Institute for Research and Development in Microtechnologies
- Institute of Physical Chemistry of the Romanian Academy;
- NANOM MEMS;
- Scientifc Research Centre for Defense, CBRN and Ecology
- Institute for Technical Physics And Materials Science (MFA), Hungarian Academy Of Sciences

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255

FIT-4-NMP

INCDMTM

National Institute of Research and Development in Mechatronics and Measurement Technique

Homepage

SCAN ME

CEFIN Publishing House

SCAN ME

About us:

- Established in 1971 our institute is active in basic and applied research and development, focused on mechatronics and smart measurement techniques.
- We are a traditional partner of Dacia – Renault Group, a pillar of the automotive sector
- Our research topics are applicable in a wide range of sectors:
  - Mechanical and plant engineering
  - Industrial automation
  - Automotive
  - Smart home and smart city
  - Medical devices
  - Smart agriculture

ACCREDITED LABS

SCAN ME

VISION

Through its entire activity, The National Institute for Research and Development in Mechatronics and Measurement Technique (INCDMTM) aims at obtaining outstanding results, that, once integrated into the industry, economy, and society, be perceived as valuable and improve life quality of as many persons as possible.

RESEARCH LABORATORIES

SCAN ME

www.ijomam.com

www.icorseng.eu

Address: Șos. Pantelimon, Nr. 6-8,
Sector 2, Bucharest, Romania
Phone: +40 21 252.30.68/69
Fax: +40 21 252.34.37

INCDMTM

FIT-4NMP received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958255