”Dunărea de Jos” University of Galați

Scientific Conference of Doctoral Schools

Perspectives and challenges in doctoral Research

14th Edition of SCDS-UDJG

11th and 12th of June 2026

BOOK OF ABSTRACTS

UNIVERSITAS GALATIENSIS

Dunărea de Jos" University of Galați

DOCTORAL SCHOOL OF FUNDAMENTAL SCIENCES AND ENGINEERING

Scientific Conference of Doctoral Schools

Perspectives and challenges in doctoral Research

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BOOK OF ABSTRACTS

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CONFERENCE PROGRAMME

THURSDAY – June 11, 2026

08:00-10:00	Invited plenary lectures
09:00-11:00	Participants registration
10:00-13:00	Invited lectures Oral presentations in concurrent sections
13:00-14:00	Lunch (building D - 1st floor)
14:00-16:00	Oral presentations in concurrent sections
16:00-16:30	Coffee break (building D - 1st floor)
16:00-18:00	Oral presentations in concurrent sections
18:00	Cultural evening

FRIDAY – June 12, 2026

09:00-10:30	Oral presentations in concurrent sections
10:30-11:00	Coffee break (building D - 1st floor)
11:00-13:00	Posters session
11:00-13:00	Workshop
13:00-14:00	Awarding ceremony. Closing ceremony
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1.ORAL PRESENTATIONS

SECTION 6: FUTURE OF ECO-NANOTECHNOLOGIES, FUNCTIONAL MATERIALS AND COATINGS

OP. 6.1.

NANO-ENABLED FOOD SENSING: SMART PACKAGING, REAL-TIME MONITORING AND SAFETY ASSURANCE

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ABSTRACT

For effective control over the quality and safety of food products, fast and efficient methods for spoilage, contamination, and adulteration detection are required. The application of nano-sensor technology provides the possibility of making advances in food quality and safety in terms of enhancing the sensitivity, selectivity, and reactivity of these methods. This presentation focuses on the use of nanoparticles made from metals and metal oxides, carbon-based nanomaterials, magnetic nanoparticles, quantum dots, and functionalized polymers as elements of modern food sensors. Special attention is paid to such types of food sensors as intelligent packaging, freshness indicators, electrochemical sensors, electronic noses, smart phone integrated sensors, as well as RFiD and NFC-based systems. At the same time, it is necessary to consider the issues of nanotoxicity and nanosafety associated with these devices.

Key words: nanomaterials; smart packaging; food safety.

OP. 6.2.

IMPROVING THE PERFORMANCE OF BALLISTIC PROTECTION MATERIALS THROUGH ADVANCED COATING TECHNOLOGIES: A REVIEW

Georgiana Ghisman Alexe[a], Gabriel-Bogdan Carp[a], Tudor-Viorel Țigănescu[b], Daniela-Laura Buruiană[a,*]

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ABSTRACT

The rapid evolution of modern weaponry has accelerated the demand for next-generation ballistic protection systems that combine lightweight design, enhanced flexibility, and high energy absorption capacity. This review outlines recent advances in the development, processing, and performance optimization of metallic, ceramic, polymeric, and composite materials for ballistic applications. Special attention is given to advanced surface coatings and nanostructured interfaces, which play a crucial role in enhancing impact resistance and enabling multifunctional performance. Traditional materials such as high-strength steels, alumina, silicon carbide, boron carbide, Kevlar®, and ultra-high-molecular-weight polyethylene (UHMWPE) remain widely used due to their excellent mechanical properties. However, their inherent limitations have driven the shift toward nanotechnology-based approaches. In this context, functional coatings incorporating nanosilica, graphene and its derivatives, carbon nanotubes (CNTs), and zinc oxide nanowires (ZnO NWs) have shown considerable improvements in interfacial bonding, inter-yarn friction, and energy dissipation. Furthermore, multifunctional coatings, including those based on CNTs and laser-induced graphene (LIG), provide additional capabilities such as sensing, electromagnetic interference (EMI) shielding, and thermal stability, supporting the development of intelligent and adaptive protection systems. By integrating experimental findings with computational modeling and materials informatics, this review emphasizes the significant role of coating-assisted strategies in advancing lightweight, high-performance, and multifunctional ballistic armor for both defense and civilian applications.

Key words: surface coatings; nanomaterials; nanotechnologies; energy absorption.

Acknowledgment: This research was funded by "Dunărea de Jos" University of Galati, Romania, grant research no. 7954/31.03.2025.

OP. 6.3.

IMPROVEMENT THE CORROSION RESISTANCE OF MILD STEEL IN 1M HCl SOLUTION USING PLANT EXTRACTS AS ECO-FRIENDLY INHIBITORS

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ABSTRACT

This study investigates the effectiveness of plant extracts as eco-friendly corrosion inhibitors, as a sustainable alternative to conventional inorganic inhibitors. The research highlights the mechanisms by which organic compounds present in plant extracts adsorb onto the metal surface, forming a protective film that reduces the rate of electrochemical reactions responsible for corrosion. The inhibition performance is strongly influenced by parameters such as inhibitor concentration, temperature, and exposure time. The results indicate that the plant extract exhibits a high inhibition efficiency of up to 92.39% in 1M HCl solution, demonstrating its strong protective capability. These findings confirm that plant-based inhibitors can serve as effective, non-toxic, and environmentally friendly alternatives to traditional corrosion inhibitors. Furthermore, the role of adsorption processes and the formation of protective surface layers is emphasized as a key factor in enhancing corrosion resistance.

Key words: mild steel; 1M HCl solution; plant extracts; corrosion resistance.

Acknowledgment: This research was funded by "Dunărea de Jos" University of Galati, Romania, grant research no. 7951/31.03.2025.

OP. 6.4.

VALORIZATION OF CALCIUM CARBIDE RESIDUE AS A LOW-CARBON BINDER FOR SUSTAINABLE CONSTRUCTION MATERIALS

Elena Ciutac (Nicolaev)[a], Daniela-Laura Buruiană[a,*], Cătălina Iticescu[b,c], Nicoleta Bogatu[a], Viorica Ghisman[a]

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ABSTRACT

This research investigates the valorization potential of calcium carbide residue (CCR), a $Ca(OH)_2$ -rich industrial by-product derived from acetylene synthesis, as a partial substitute for conventional binders in the production of paving elements and non-thermally activated masonry blocks. Adopting circular economy principles, the study evaluates the synthesis of these units by replacing Portland cement (OPC) with 10-30 wt.% CCR. Experimental results demonstrate that CCR integration facilitates a reduction in specific CO_2 emissions by up to 25% through clinker minimization. The study concludes that CCR utilization represents an effective strategy for producing low-carbon paving and masonry units, providing a viable solution for industrial waste immobilization and the conservation of primary mineral resources.

Key words: calcium carbide residue; circular economy; low-carbon binder; sustainable construction materials.

Acknowledgment: This work was supported by the research project "Industrial Waste Recovery: Opportunities at the Romania-Moldova Border in Alignment with the European Green Pact", contract number 47PCBROMD from 1 September 2025.

OP. 6.5.

INVESTIGATION OF CORROSION RESISTANCE OF LOW ALLOY STEEL BVDH36 IN NATURAL SEA WATER BY ELECTROCHEMICAL METHODS

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ABSTRACT

Marine corrosion is a permanent problem, not only for ships in motion or stationary, but also for all port facilities, desalination plants and objects that come into prolonged contact with water and the marine atmosphere. There has been interest in using low-alloy steels for deep-sea applications due to their excellent mechanical properties, general corrosion resistance, biocompatibility, and weldability in marine environments. The purpose of this study is to evaluate the corrosion resistance in natural sea water (Navodari area) of the low alloyed carbon steel BVDH36 by electrochemical methods. BVDH36 steel is used in ship hull construction. The electrochemical methods used were the evolution of the free potential (OCP), electrochemical impedance spectroscopy (EIS), polarization resistance (R_p) and corrosion rate (V_{corr}), potentiodynamic polarization (PD), and cyclic voltammetry (CV). The studies were completed by ex situ characterization analyzes of the surfaces studied before and after corrosion such as optical microscopy, scanning electron microscopy and X-ray diffraction analysis.

Key words: corrosion; low alloyed steel; electrochemical impedance spectroscopy; sea water.

OP. 6.6.

PREVENTING FREEZE-THAW DEGRADATION USING SMART SENSOR TECHNOLOGIES

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ABSTRACT

Freeze-thaw cycles represent a major deterioration mechanism affecting asphalt mixtures, particularly in cold and temperate climates. Repeated freezing and thawing of water within porous materials leads to internal stress, microcracking, and progressive structural degradation, ultimately compromising durability and safety. The susceptibility of asphalt mixtures to freeze-thaw damage is strongly influenced by air void content, pore size distribution, binder properties, and aggregate mineralogy. This study explores modern strategies for preventing such damage through the integration of smart sensor technologies. The proposed approach focuses on embedding intelligent sensors within materials and structural elements to continuously monitor critical parameters such as temperature, moisture content, and internal strain. By collecting real-time data, these systems enable early detection of conditions conducive to freeze-thaw damage. Advanced data processing and predictive algorithms are employed to assess risk levels and support timely preventive interventions. A data-driven approach is employed to correlate sensor outputs with damage evolution, enabling the establishment of predictive indicators for degradation onset. Based on these indicators, preventive strategies-such as optimized drainage, adaptive maintenance, or material modification-can be implemented before significant structural damage occurs. Furthermore, the integration of Internet of Things (IoT) frameworks enhances data accessibility and supports remote monitoring of infrastructure. The results highlight the potential of smart sensor technologies to transform conventional asphalt materials into self-monitoring systems, capable of supporting proactive maintenance and extending service life. This approach contributes to the development of more durable and resilient pavement materials and also to the development of proactive maintenance strategies and sustainable infrastructure management in environments affected by freeze-thaw phenomena.

Key words: asphalt durability; smart sensors; advanced road materials; freeze-thaw cycles.

Acknowledgment: This work was supported by the research project "Industrial Waste Recovery: Opportunities at the Romania-Moldova Border in Alignment with the European Green Pact", contract number 47PCBROMD from 1 September 2025.

OP. 6.7.

THERMOMECHANICAL CHARACTERIZATION OF $Ni_{50.3}Ti_{49.7}/Fe_{57}Mn_{27}Si_{11}Cr_5$ (at.%) BILAYER COMPOSITE MODULE PROCESSED VIA HIGH SPEED HIGH PRESSURE TORSION

Cristian Ştefănescu[a,*], Daniela-Laura Buruiană[a], Carmela Gurău[a], Mihaela Marin[a], Florin-Bogdan Marin[a], Gheorghe Gurău[a]

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ABSTRACT

A highly efficient severe plastic deformation technique, High Speed High Pressure Torsion (HSHPT), is utilised to fabricate shape memory alloy active elements exhibiting revolution symmetry, capable of generating axial displacement. The active element (module), characterized by a truncated cone geometry, was fabricated from rings of binary Ni-Ti and quaternary Fe-Mn-Si-Cr SMAs. This study describes the fabrication process of the $Ni_{50.3}Ti_{49.7}/Fe_{57}Mn_{27}Si_{11}Cr_5$ (at.%) bilayer composite module and evaluates its thermomechanical properties. The shape characteristic ratio (SCR) was calculated based on the geometric dimensions of the module. The module was tested using an Instron 3382 universal testing machine equipped with a thermal chamber. It was subjected to five static compression cycles at a crosshead speed of 0.5 mm/min, applied between flat platens at room temperature. The second test involved compressing the module at a constant stroke (approximately 0.5 mm), followed by heating to 180 °C in a constrained state. The aim of these tests was to establish the force-stroke response of the $Ni_{50.3}Ti_{49.7}/Fe_{57}Mn_{27}Si_{11}Cr_5$ bilayer composite module under cyclic compression at room temperature, as well as to evaluate the recovery force variation with temperature and determine the critical temperatures for the reverse martensitic transformation.

Key words: severe plastic deformation; HSHPT; shape memory composites.

OP. 6.8.

ADVANCED PROTECTIVE COATINGS AND STRATEGIES FOR EXTENDING THE SERVICE LIFE OF MATERIALS USED IN NAVAL INDUSTRY

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ABSTRACT

This paper presents an integrated analysis of various strategies aimed at improving the long-term performance and durability of materials used in critical industrial sectors, such as the naval field. In the area of maritime engineering, it is very important to understand the complex way in which corrosion, fatigue, and mechanical loading work together to cause material failure. This study looks closely at how material composition and the latest surface engineering technologies play a role in preventing these specific degradation mechanisms from damaging structures over time. The study focuses on the practical use of high-performance multi-layer systems. These systems usually include special primers and hydrophobic topcoats that are designed to protect metallic surfaces from the very harsh conditions found at sea, such as salt water and high humidity. The paper also discusses why it is important to use certain processes that help delay the start of corrosion in structural steel. A very important part of this study is the focus on proper surface preparation. Without the right preparation, even the best materials can fail, so this research emphasizes modern techniques that help improve how well coatings stick to the surface and how they help the material resist fatigue and stress. The paper contributes to finding sustainable and cost-effective solutions by following the principles of the circular economy and remanufacturing. This approach is useful because it does not just extend the life of high-performance materials but also helps in reducing the environmental footprint and the high operational costs of modern maritime infrastructure. In the end, the results of this study provide a clear and practical framework for selecting the right protective strategies. This ensures that materials stay durable and reliable even when they are used in very complex and difficult industrial applications.

Key words: naval industry; protective coatings; marine environment; corrosion protection.

Acknowledgment: This paper acknowledges the project entitled Romanian System for Identification and Marking of Wrecks on the Danube River—RoSIBEFD, SMIS Code: 332354, Priority: P1. Supporting and promoting an attractive and competitive RDI ecosystem in Romania; Specific objectives: ERDF-RSO1.1_Developing and enhancing research and innovation capacities and adopting advanced technologies.

OP. 6.9.

INTELLIGENT SYSTEMS FOR IDENTIFYING AND MARKING WRECKS IN THE DANUBE RIVER: A DIGITAL TWIN-BASED APPROACH, INTEGRATING ARTIFICIAL INTELLIGENCE AND ADVANCED MATERIALS

Petrică-Cătălin Aramă[a], Daniela-Laura Buruiană[a,*], Gabriel-Bogdan Carp[a], Viorica Ghisman[a]

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ABSTRACT

The increasing complexity of inland waterway transport and the morphological dynamics of river environments generate significant challenges for navigation safety, especially in the presence of sunken, often uncharted, wrecks. The Danube River, as one of the main transport corridors in Europe, is particularly vulnerable to such risks, which can lead to accidents, environmental impacts and operational inefficiencies. The research proposes an integrated framework for intelligent identification, assessment and marking of sunken wrecks, by developing a Digital Twin of the Danube. The proposed system combines real-time data acquisition from sonar systems, autonomous surface and underwater vehicles, as well as IoT-based smart beacons, with advanced artificial intelligence techniques for the detection, classification and risk assessment of underwater objects. The central component of the architecture is the Digital Twin, which dynamically reproduces the physical state of the river, allowing continuous monitoring, predictive modeling of sedimentation processes and object movement, as well as the simulation of operational scenarios. The study also explores the integration of advanced materials in the design of adaptive marking systems, including corrosion-resistant materials with anti-biofouling properties, contributing to increasing the durability and autonomy of smart signaling means. The synergy between artificial intelligence-based analysis and innovation in the field of materials allows the transition from passive mapping to an active, self-updating, navigation safety system. The proposed approach contributes to the development of intelligent river management systems, offering a scalable solution with dual applicability, both in the civil and security and military fields. This supports decision-making, reduces operational risks and improves environmental protection, while also constituting a basis for future developments in autonomous monitoring and digital inland waterway infrastructures.

Key words: artificial intelligence, advanced materials, Danube River.

Acknowledgment: This paper acknowledges the project entitled Romanian System for Identification and Marking of Wrecks on the Danube River—RoSIBEFD, SMIS Code: 332354, Priority: P1. Supporting and promoting an attractive and competitive RDI ecosystem in Romania; Specific objectives: ERDF-RSO1.1_Developing and enhancing research and innovation capacities and adopting advanced technologies.

OP. 6.10.

COMPARATIVE LOCAL CHARACTERIZATION OF BULLET JACKET REGIONS IN CONVENTIONAL AND FRANGIBLE ARMOR-PIERCING PROJECTILES

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ABSTRACT

This study presents a comparative local characterization of bullet jacket regions from a conventional projectile and a frangible armor-piercing (FAP) projectile. The investigated regions were analyzed by scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX), Fourier-transform infrared spectroscopy (FTIR), and Vickers hardness testing, to assess surface morphology, local chemical composition, and mechanical response. SEM observations revealed distinct morphological features: the conventional projectile showed irregular topography, localized discontinuities, micro-cracks, and heterogeneous surface characteristics, whereas the FAP projectile displayed a comparatively more compact morphology in the selected region. SEM-EDX results indicated strong area-dependent composition. The conventional projectile mapped region was dominated by carbon and oxygen, with minor elemental contributions, suggesting a surface-affected heterogeneous region. For the FAP projectile, the map also showed a carbon-oxygen-rich surface, while local spectra identified Cu-O-rich areas with minor Mo and Fe contributions. FTIR spectra supported the presence of organic-related and inorganic surface contributions. Vickers hardness testing indicated higher local resistance to indentation for the FAP region. The results highlight local structure-composition-property relationships and underline the need for further mechanical and dynamic impact investigations to correlate these findings with ballistic performance. The findings should be considered local material indicators, not complete bulk descriptions of the projectiles.

Key words: bullet jacket; FAP projectile; microstructure-property correlation.

Acknowledgment: This research was funded by "Dunărea de Jos" University of Galati, Romania, grant research no. 7954/31.03.2025.

OP. 6.11.

RECENT ADVANCES IN CRYOGENIC STORAGE SYSTEMS: MATERIAL PERSPECTIVES

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ABSTRACT

Cryogenic technologies are an essential element in the development of modern engineering systems, playing a central role in the storage, transport and use of liquefied gases at extremely low temperatures. These technologies are widely used in areas such as aerospace engineering, the energy sector, including hydrogen-based applications, as well as in high-performance medical equipment. In this context, the efficiency and safety of cryogenic systems directly depend on the performance of storage tanks, which must ensure effective thermal insulation and limit energy losses generated by heat transfer from the ambient environment. The present paper aims to systematically analyze recent developments in the field of cryogenic storage systems, focusing on the thermophysical processes that influence the behavior of fluids at low temperatures. Both single-phase and two-phase regimes are investigated, with particular attention paid to boiling, evaporation and condensation phenomena, as well as their interaction with the tank walls. The fundamental heat transfer mechanisms - conduction, convection and radiation - and their impact on thermal stability, mass loss and overall efficiency of the storage system are also analyzed. Another important aspect addressed in the study is the progress made in the field of materials used for the construction of cryogenic tanks. The characteristics of low-temperature resistant alloys, their behavior under thermal and mechanical stress conditions, as well as modern protective solutions, such as functional coatings and surface treatments, are discussed. These innovations significantly contribute to reducing corrosion phenomena, increasing durability and improving the long-term reliability of systems. By integrating aspects related to fluid behavior and material performance, the paper provides a comprehensive perspective on current research and development directions in the field of cryogenic storage, highlighting existing challenges and potential engineering solutions for optimizing these systems.

Key words: cryogenic technologies; cryogenic storage; low temperatures; heat transfer.

Acknowledgment: This research was funded by "Dunărea de Jos" University of Galati, Romania, grant research no. 7954/31.03.2025.

2.POSTERS

SECTION 6: FUTURE OF ECO-NANOTECHNOLOGIES, FUNCTIONAL MATERIALS AND COATINGS

PP. 6.1. NANOSTRUCTURED MATERIALS FOR HYBRID SUPERCAPACITORS

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ABSTRACT

The supercapacitors (SC) are considered critical energy storage devices for sustenable development of applications in various field, as portable electronics, electric cars and grid-scale emerging storage systems of the regenerable energy [1]. Being able to store and release large amounts of energy very quickly, they compensate for fluctuations in renewable sources (solar radiation and wind) ensuring the stabilization of the energy grid and the sustainable use of green energy. Nanotechnology is the key in the design of new multifunctional nanostructured materials with a synergistic effect in the operation of optimized configurations of electrodes, electrolyte and dielectric in ultra-performant SCs. Carbon-based (graphene, carbon nanotubes) and carbon activated nanomaterials (CA), together with nanostructured oxides/hydroxides, chalcogenides, metal-organic frameworks, conductive polymers and/or heteroatom dopants (MXene) are intensively investigated for this purpose [2]. This paper presents a review state of art emerging type of energy storage devices, named hybrid SCs, which can be hybrid by the classes of chemical components used in the electrodes design, the configuration of the associated electrodes and the mechanism of operation (hybrid storage). The main objective of the bibliographic study was to identify the pseudocapacitive materials with high energy densities without compromising power density and cyclic stability, fundamental characteristics of these devices.

Key words: electrical energy storage; hybrid supercapacitors; nanostructured composite electrodes and dielectrics.

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