Special-session I

1. The title

Special Session on Nanocomposites: Emerging Structures, Tunable Properties, and Advanced Applications

2. General information of organizers

Organizer I: Dr. Oscar E. Cigarroa-Mayorga, National Polytechnic Institute of Mexico (IPN), Mexico

E-mail: ocigarroam@ipn.mx

Biodata: Dr. Oscar Eduardo Cigarroa-Mayorga is a professor and researcher at the National Polytechnic Institute of Mexico (IPN), affiliated with UPIITA in Mexico City. He earned his Ph.D. in Nanoscience and Nanotechnology from CINVESTAV, where he specialized in the synthesis and characterization of advanced nanomaterials. His scientific work bridges fundamental research and applied innovation, particularly in the fields of nanostructures, solid-state physics, and biomedical applications. He currently leads the Laboratory of Systems for Cancer Diagnosis and Treatment (LSDTC), where his group focuses on the design of nanomaterials for theranostics, advanced imaging, and innovative cancer detection tools. His research has explored topics such as surface-enhanced Raman scattering (SERS), nanocomposite fabrication, and nanoparticle-based biomedical systems. Dr. Cigarroa-Mayorga has authored over 40 peer-reviewed publications and has accumulated more than 300 citations, reflecting his growing impact in the scientific community. His contributions have been recognized with awards such as the Best Master's Dissertation by the Mexican National Institute of Electricity and Clean Energies (INEEL) and the Youth Prize of Mexico City for Academic Merit. Through his work, he actively promotes translational nanoscience, fostering collaborations in Mexico and abroad to advance materials research for health, energy, and environmental applications.

Organizer II: Dr. Yazmín M. Hernández-Rodríguez, National Polytechnic Institute of Mexico (IPN)

E-mail: yazmin.hernandez@cinvestav.mx

Biodata: Dr. Yazmín Mariela Hernández-Rodríguez is a highly recognized researcher and professor at the National Polytechnic Institute of Mexico (IPN). She earned her degree in Materials Engineering at the Autonomous University of the State of Hidalgo and later obtained her Ph.D. in Nanosciences and Nanotechnology at CINVESTAV-IPN, where she consolidated her expertise in the design and functionalization of advanced materials. Her scientific career is distinguished by a multidisciplinary approach that integrates materials science, nanotechnology, and biomedical engineering. She is co-founder of the Laboratory of Systems for Cancer Diagnosis and Treatment (LSDTC) at UPIITA-IPN, where she develops nanomaterials for biomedical imaging, cancer diagnosis, and treatment, as well as functional materials for environmental and energy applications. Her research includes metal-based nanomaterials for theranostics, metal oxides for gas sensors, photocatalysis, and renewable energy technologies. Dr. Hernández-Rodríguez has authored scientific articles, book chapters, and intellectual property contributions. She has held leadership roles in national scientific societies, serving as president of the organizing committee for specialized congresses and as founder of academic initiatives such as the Virtual School of Materials Characterization. Recognized as a member of the National System of Researchers, she continues to drive innovation and collaboration in advanced materials science.

3. Brief description of special sessions

The special session “Nanocomposites: Emerging Structures, Tunable Properties, and Advanced Applications” at ICAMR 2026 will provide an on-site platform for exchanging knowledge on the most recent advances in the design, fabrication, and application of nanocomposite materials. As one of the most dynamic areas in advanced materials research, nanocomposites combine nanoscale components into functional systems that display enhanced and often unique properties, enabling innovations that transcend traditional material boundaries. This session will highlight the intricate relationship between structure, processing, and performance, exploring how synthesis strategies, interface control, and advanced characterization techniques contribute to achieving superior functionalities. Contributions will address both experimental and theoretical approaches, showcasing how computational modeling and artificial intelligence are complementing laboratory developments to accelerate the design of new materials. By connecting nanoscale properties

with macroscopic applications, the session will demonstrate the transformative impact of nanocomposites in areas such as biomedicine, energy, environment, and electronics.

A strong emphasis will be placed on the translation of fundamental insights into application-driven solutions. Presentations will explore how nanocomposites are being developed for medical diagnostics and therapies, renewable energy technologies, catalytic systems, sustainable production routes, and next-generation devices. These discussions will reflect the importance of multidisciplinary collaboration, uniting expertise from physics, chemistry, engineering, and life sciences to address complex global challenges. By fostering dialogue among leading researchers, early-career scientists, and industrial stakeholders, the session aims to stimulate innovation and establish collaborations that push the frontiers of knowledge. Participants will gain exposure to cutting-edge developments, emerging methodologies, and visionary concepts that position nanocomposites at the heart of future technological revolutions. The session aspires to inspire new research pathways, strengthen international cooperation, and underscore the pivotal role of nanocomposites in shaping sustainable and high-performance solutions for society.

4. Related topics

1. Advanced synthesis methods for nanocomposites
2. Structural design and hierarchical architectures
3. Interface and interphase engineering
4. Mechanical reinforcement and durability of nanocomposites
5. Optical and photonic properties of hybrid systems
6. Electronic and magnetic nanocomposites
7. Thermal transport and conductivity control
8. Surface-enhanced Raman scattering (SERS) substrates
9. Nanocomposites for energy storage (batteries and supercapacitors)
10. Photocatalysis and solar energy conversion
11. Nanocomposites for fuel cells and hydrogen evolution
12. Biomedical nanocomposites for imaging and theranostics
13. Drug delivery systems and smart biomaterials

14. Environmental remediation and water purification
15. Gas sensing and pollutant detection
16. Flexible, wearable, and stretchable electronics
17. 3D printing and additive manufacturing of nanocomposites
18. Sustainable and green synthesis approaches
19. Computational modeling and AI-assisted design of nanocomposites
20. Industrial applications and scalability challenges

5. Potential participants

Juan Manuel Vigueras Cortes Modalidad A

Flavio Arturo Dominguez Pacheco

Jazmin Garcia Machorro Modalidad A

Jorge Sosa Pedroza

Oscar Camacho Nieto

Rosalva Mora Escobedo

Judith Pacheco Yepez

Ignacio Eduardo Maldonado Mendoza

Alicia Ortiz Moreno Modalidad

Jose Antonio Calderon Arenas

Georgina Calderon Dominguez

Daniel Ramirez Rosales

Elba Reyes Maldonado

Abdu Orduña Diaz

Jesus Morales Ramirez

Edilso Reguera Ruiz Modalidad

Gabriel Sanchez Perez

Norberto Hernandez Como

Juan Carlos Chimal Eguia

Ivonne Maria Olivares Corichi