Fluid Dynamics & Materials Processing

Tech Science Press

Doi:10.32604/fdmp.2025.062122

EDITORIAL

Foreword to the International Conference on Materials and Energy (ICOME 2023)

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Received: 10 December 2024; Accepted: 31 December 2024; Published: 06 March 2025

1 Foreword

The crises produced by the COVID-19 pandemic and the ongoing Russia-Ukraine conflict have starkly highlighted the critical need for scientific innovation and global cooperation. The pandemic underscored the urgency of swift, science-driven responses to worldwide health emergencies, while the war has intensified energy shortages and material scarcities, amplifying the demand for sustainable and resilient solutions. Against this backdrop, the International Conference on Materials and Energy (ICOME) 2023, hosted by the University of Campania "L. Vanvitelli" in Caserta, Italy, from 30th May to 1st June, and jointly organized by the Departments of Engineering and Political Science, brought together leading minds in various fields. The conference delved into pressing topics such as eco-materials, advanced materials, sustainable construction, fluid-dynamics and innovative energy systems. Aimed at harmonizing traditional expertise with cutting-edge approaches, ICOME 2023 emphasized fostering international collaboration, particularly within the Mediterranean region, to address shared challenges and drive transformative solutions for a more sustainable future.

ICOME 2023 was chaired by Prof. Biagio Morrone from the University of Campania "L. Vanvitelli," Prof. Mohammed El Ganaoui from the University of Lorraine, and Prof. Rachid Bennacer from the University of Paris-Saclay, who served as Chairs of the conference series.

ICOME 2023 highlighted the importance of such conferences in facilitating knowledge exchange and fostering innovative solutions, particularly during global crises. By addressing scientific and socio-economic challenges, ICOME remains pivotal in advancing materials and energy fields, contributing to a sustainable and resilient future.

The conference also highlighted the urgent need for sustainable solutions and alternative energy sources. Notable international experts, including Prof. Yogesh Jaluria, Dr. Akshai Runchal, Prof. Gian Luca Morini, Prof. Marcello Lappa, and Prof. Mario Minale, led discussions on key issues in materials and energy. Furthermore, the conference featured a satellite workshop on converting waste materials into agricultural biostimulants, which demonstrated practical applications of sustainable materials science. The workshop was organised by Prof. Petronia Carillo of the University of Campania "L. Vanvitelli", focused on using waste

materials to produce agricultural amendments and biostimulants. Esteemed speakers, such as Professors Maria Antonietta Rao and Youssef Rouphael from the University of Naples Federico II, contributed to the workshop. The presence of these distinguished experts underscored the event's high scientific calibre. Selected papers were published in the *Fluid Dynamics and Material Processing (FDMP)*, *Frontiers in Heat and Mass Transfer (FHMT)*, and *Energy Engineering (EE)* journals, by Tech Science Press, further highlighting their significance and quality.

During this edition of ICOME 2023, participants engaged in three days of intensive activities, including eleven sessions and twelve plenary lectures delivered by renowned scientists. The conference was organized around three mini-symposia dedicated to cutting-edge topics such as Fire Physics and Simulations, Waste-Derived Biomaterials and Biostimulants for Sustainable Agriculture, and Photonics for Energy (Fig. 1).

Longwy

La transition énergétique passe par l'Italie pour l'IUT

L'institut universitaire de technologie (IUT) de Longwy vient de participer activement à un grand colloque international sur les matériaux et l'énergie en Italie. L'occasion de penser l'avenir avec des scientifiques venus du monde entier.

Les Longoviciens étaient en nombre à Naples pour la conférence internationale sur les matériaux et l'énergie. Photo DR

Fin mai, début juin, l'institut universitaire de technologie (IUT) de Longwy et ses partenaires, les universités Paris-Saclay et de Campania (Naples II) ont organisé près de Naples la septième édition de la conférence internationale sur les matériaux et l'énergie (Icome). Pour mémoire, en 2021, c'est l'université de Lorraine et le site de Metz qui accueillaient les conférences de scientifiques internationaux de renom, les colloques ou encore les échanges avec les étudiants sur des thèmes liés à la transition énergétique et l'environnement.

Cette année, direction le sud de l'Italie pour Mohammed El Ganaoui, professeur et chercheur en génie thermique et énergie à l'IUT, et ses collègues. « Cette édition a tenu toutes ses promesses d'excellence et de transmission du savoir. On a travaillé et échangé sur l'énergie et ses transformations, les énergies alternatives et renouvelables, l'innovation dans les matériaux et leur application dans la vie de tous les jours, etc. », résume le Longovicien.

Des scientifiques et représentants d'une vingtaine de pays étaient présents, et notamment des experts dans les domaines de la raréfaction des matériaux et des ressources, le réchauffement climatique, la résilience urbai-

Le « savoir-faire » lorrain

CASERTANEWS

Ecomateriali ed energia, conferenza internazionale alla "Vanvitelli"

Ecomateriali, costruzioni sostenibili, sistemi energetici e di stoccaggio dell'energia. Dal 30 maggio al 1 giugno, al Dipartimento di Scienze politiche dell'Università della Campania "Luigi Vanvitelli" di Caserta, in viale Ellittico, si terrà l'International Conference on Energy and Materials - ICOME 2023.

Curata dal Dipartimento di Ingegneria e dallo stesso Dipartimento di Scienze politiche, la conferenza rappresenta una preziosa occasione di confronto annuale su tematiche legate alla sostenibilità dei materiale e all'energia. L'organizzazione scientifica locale è affidata al professor Biagio Morrone, in qualità di "chair" della conferenza, e ai colleghi Mohammed El Ganaoui dell'Università della Lorena e Rachid Bennacer dell'Università di Paris-Saclay. Dal punto di vista scientifico, si procederà all'analisi comparata di materiali tradizionali e innovativi e del corrispondente consumo energetico.

Figure 1: Local newspaper coverage of the ICOME 2023 event in France (Longwy) and Italy (Caserta)

Climate change emerged as a pivotal theme, emphasizing its critical importance for the planet's future. This theme intersects with the broader challenges of materials and energy, highlighting the necessity for integrated solutions. The lectures throughout the conference emphasized the essential role of materials and energy in driving human progress, fostering cultural exchange, and pursuing truth. This ethos is embodied by the Averroes Award, which celebrates significant contributions to international scientific collaboration. Averroes, a 12th-century Andalusian polymath, aptly stated, "Knowledge acquired in a foreign country can be a homeland, and ignorance can be an exile lived in one's own country".

ICOME 2023 featured seven keynote speakers, whose presentations underscored the conference's high scientific caliber. Dr. Yogesh Jaluria discussed convective transport in channels due to combined shear and imposed pressure effects. Prof. Mario Minale covered the rheology of dense suspensions under oscillatory shear, while Prof. Gian Luca Morini focused on mini/microchannels and metal foams for enhanced heat exchangers. Dr. Akshai Runchal spoke on CFD, AI, and machine learning applications in fluid dynamics, and Prof. Marcello Lappa presented on solid particle self-assembly in time-periodic flows. Dr. François Joseph Chatelon explored the Balbi model for surface fire propagation, and Dr. Mohamed Tabaa highlighted emerging technologies and innovations for a sustainable energy industry.

In addition to the keynote speakers, the mini-symposia showcasing the latest research and developments. Prof. Petronia Carillo led discussions on Waste-Derived Biomaterials and Biostimulants for

Sustainable Agriculture, examining how waste materials can be transformed into valuable agricultural biostimulants. Dr. Hassina Derbal Habak explored applications of Photonics for Energy, focusing on renewable energy solutions. Dr. Sofiane Meradji, Dr. Jean-Louis Rossi, and Dr. Thierry Marcelli delved into the dynamics of fire spread and modeling in their symposium on Fire Physics and Simulations. The conference also featured four invited lectures, each contributing unique insights into their respective fields. Dr. Yamina Mebdoua Lahmar discussed the integration of photovoltaic devices on nonconductive surfaces using thermal spray coatings. Prof. Aldo Amirante examined legal models for alternative energies and energy communities in European laws. Dr. Abdelatif Merabtine presented advances in modelling and experimentation of the thermal behaviour of heating systems, and Dr. Bilal Amghar highlighted control and optimization opportunities in integrating renewable energy into complex energy systems.

The conference culminated in the presentation of awards recognizing outstanding contributions. The Best Presentation Award was given to PhD students who excelled in their respective sessions. The prestigious Averroes Award, which honors significant contributions to international scientific partnership and development, was awarded to Prof. Yogesh Jaluria, Rutgers University, USA for his exceptional work in convective heat transfer.

The organizers of ICOME 2023 extended their heartfelt thanks to all participants and supporting entities, with special recognition given to the laboratories and institutes of the University of Lorraine, which have supported the ICOME series since its inception. Particular appreciation was extended to Prof. Biagio Morrone for his role as Conference Chair and to Profs. Mohammed El Ganaoui and Rachid Bennacer for their invaluable contributions as series Chairs.

ICOME 2023 showcased significant scientific advancements and provided a vital platform for fostering international collaborations. The conference highlighted the critical need for sustainable practices and innovations in materials and energy, aiming to address current and future global challenges and ensure the continued progress and resilience of our societies (Fig. 2).

Figure 2: Entities that allowed publication of papers in Fluid Dynamics and Material Process international journal (FDMP)

2 ICOME Serie's Spirit

The ICOME series and school is an initiative of Paris Saclay (ENS Cachan) and the University of Lorraine (Institut Henri Poincaré of Longwy). Prof. R. Bennacer (UPS) and Prof. M. El Ganaoui (UL), after a large concertation highlighting international personalities and actively acting in existing Int. Serie's (JITH, ICTEA, CHT, ICCHMT, ICCREMA, CFM, ...)[1] in 2013–2015 operated to create and to chair a new series both

[1]CHT Computational Heat Transfer (G.D. Davis et al.)–CFM Congrès Français de Mécanique (M. Combarnous et al.)–ICCHMT Int. Conf. Comp. Heat and Mass Transfer (A.A. Mohamad et al.)–ICTEA (Z. Saghir et al.)–JITH Journée Int. de Thermique (R. Martin et al.)–ICCREMA Renewable Ener Mat. Applications (H. Sammouda et al.).

operating on Material Sciences and Energy. The project aims to interlink the two communities dealing with either the materials used in order to produce/reduce the energy demand, or the energy used to produce new materials and the related life quality. The goal is to allow communication between these two sub-domains to allow interlinked projects. Consequently, disciplines as heat transfer, fluid mechanics, and automatics acting on energy-applied materials and *vice versa* will be developed in the hospices of ICOME.

Indeed the first International Conference on Materials & Energy (ICOME 2015) was held in the nice Mediterranean city Martial-Tetouan in Morocco, followed by the edition of 2016 in the beautiful Atlantic city of La Rochelle in France, the edition 2017 in the amazing Eastern part of China at Tianjin, ICOME 2018 in the sunny coastal city Donostia-San Sebastian located at the North of Spain, ICOME 2019 in the sweet city of Hammamet in Tunisia and back to France ICOME 2021 in a successful online edition with Headquarter in the nice city of Metz. 2022 held in the amzing city of Baku in Azarbaijan mixing online and onsite presentations.

The following provides a summary of the keynote/invited lectures delivered in the frame of this conference together with a short biography of the invited speakers.

3 Keynote/Invited Lectures during ICOME 2023

Keynote Speaker: Dr. Yogesh Jaluria

Topic: Convective Transport in Channels due to Combined Effects of Shear and Imposed Pressure

Dr. Yogesh Jaluria's presentation delved into the dynamics of convective transport within channels, influenced by the interplay between shear forces and externally imposed pressure. His insights were particularly relevant to improving the efficiency of thermal systems and understanding the fluid mechanics involved in various engineering applications. Dr. Jaluria emphasized how understanding these complex interactions can lead to advancements in the design of more efficient cooling systems, which are critical in numerous industrial processes.

Biography: Dr. Yogesh Jaluria is a distinguished professor with extensive contributions to the field of thermal sciences and fluid dynamics. He has authored numerous peer-reviewed papers and several seminal books on convective heat transfer and computational fluid dynamics (CFD). Dr. Jaluria's research has significantly impacted both academia and industry, making him a leading figure in his discipline. His career is marked by numerous accolades, reflecting his pioneering work and his role in shaping modern thermal engineering practices. His work has advanced theoretical understanding and led to practical applications that benefit a wide range of industries, from aerospace to energy production.

Keynote Speaker: Prof. Mario Minale

Topic: The Rheology of Dense Suspensions under Oscillatory Shear

Prof. Mario Minale explored the complex rheological behavior of dense suspensions when subjected to oscillatory shear. His lecture provided valuable insights into the microstructural changes and stress responses within these materials, which are crucial for material processing and formulation applications. Prof. Minale illustrated how these rheological properties can be manipulated to optimize product performance in pharmaceuticals, food processing, and cosmetics industries.

Biography: Prof. Mario Minale is a renowned rheology and fluid mechanics expert. His research focuses on the behaviour of complex fluids and suspensions, contributing to theoretical and applied rheology

advancements. Prof. Minale has published extensively in top-tier journals and is a sought-after speaker at international conferences. His contributions to the field have been recognized with numerous awards, and his work continues to influence the development of new materials and processes across various industrial sectors.

Keynote Speaker: Prof. Gian Luca Morini

Topic: Mini/Microchannels and Metal Foams for Enhanced Heat Exchangers

Prof. Gian Luca Morini's lecture addressed the use of mini and microchannels, along with metal foams, to enhance the performance of heat exchangers. His work is pivotal in developing more efficient cooling systems for electronic devices and other high-heat-flux applications. He discussed the challenges and opportunities in optimizing these systems for better thermal management and energy efficiency.

Biography: Prof. Gian Luca Morini is a leading researcher in the field of heat transfer and thermodynamics. He has made significant contributions to the design and optimization of advanced thermal management systems. Prof. Morini's innovative research has been widely recognized and has earned him numerous awards and honors. His work bridges the gap between fundamental research and practical applications, making a significant impact on the development of sustainable technologies.

Keynote Speaker: Dr. Akshai Runchal

Topic: CFD, AI, and Machine Learning Applications in Fluid Dynamics

Dr. Akshai Runchal discussed the integration of CFD with artificial intelligence (AI) and machine learning to solve complex fluid dynamics problems. His presentation highlighted the potential of these technologies to revolutionize the field by enhancing predictive capabilities and optimizing design processes. Dr. Runchal demonstrated how AI and machine learning can be used to analyze large datasets, improve simulation accuracy, and develop new models that capture the intricacies of fluid behavior.

Biography: Dr. Akshai Runchal is the founder of ACRi, a pioneering company in computational fluid dynamics. With a career spanning several decades, he has been at the forefront of developing and applying CFD technologies. Dr. Runchal's work has had a profound impact on various industries, including aerospace, automotive, and environmental engineering. His contributions have been instrumental in advancing the field of CFD, making complex fluid dynamics more accessible and applicable to real-world problems.

Keynote Speaker: Prof. Marcello Lappa

Topic: Solid Particle Self-Assembly in Time-Periodic Flows

Prof. Marcello Lappa presented his research on the self-assembly of solid particles in time-periodic flows. His findings are significant for understanding natural phenomena and designing advanced materials with tailored properties. He explained how controlling the conditions of time-periodic flows can lead to the formation of organized structures, which have applications in materials science, biology, and nanotechnology.

Biography: Prof. Marcello Lappa is an esteemed pupil specialising in fluid mechanics and material science. His pioneering work on particle dynamics and self-assembly has been published in numerous high-impact journals. Prof. Lappa's innovative research continues to push the boundaries of his field, contributing to the development of new materials and technologies that can benefit a wide range of applications, from industrial manufacturing to biomedical engineering.

Keynote Speaker: Dr. François Joseph Chatelon

Topic: The Balbi Model for Surface Fire Propagation

Dr. François Joseph Chatelon explored the Balbi model for predicting the propagation of surface fires. His insights are crucial for developing better fire management and mitigation strategies, particularly in the context of increasing wildfire incidents globally. He highlighted the model's ability to simulate fire spread under various conditions, providing valuable data for improving safety protocols and firefighting techniques.

Biography: Dr. François Joseph Chatelon is a leading expert in fire dynamics and modeling. His research has significantly advanced the understanding of fire behavior, contributing to improved safety measures and firefighting techniques. Dr. Chatelon is highly respected for his contributions to both theoretical and practical aspects of fire science, and his work has been instrumental in developing models that are now widely used by fire management agencies around the world.

Keynote Speaker: Dr. Mohamed Tabaa

Topic: Emerging Technologies and Innovations for a Sustainable Energy Industry

Dr. Mohamed Tabaa highlighted the latest emerging technologies and innovations aimed at creating a more sustainable energy industry. His lecture emphasized the importance of integrating new technologies to address current energy challenges and promote sustainability. Dr. Tabaa discussed various advancements in renewable energy sources, energy storage solutions, and smart grid technologies, illustrating how these innovations can lead to a more efficient and resilient energy system.

Biography: Dr. Mohamed Tabaa is a prominent researcher and innovator in the field of sustainable energy. His work focuses on developing and implementing cutting-edge technologies to enhance energy efficiency and reduce environmental impact. Dr. Tabaa's contributions are highly regarded in both academic and industrial circles. His research has led to the development of several key technologies that are now being used to improve the sustainability and efficiency of energy systems worldwide.

4 The Averroes Award

The Averroes prize (Fig. 3) was introduced in 2015 to distinguish scientists or actors in science who have worked for the training of young scientists and contributed significantly to the scientific impact on society.

The Averroes committee, composed of some previous winners and esteemed members, selected and awarded the prestigious Averroes Award. The 2023 edition honored Dr. Yogesh Jaluria for his exceptional contributions to convective transport in thermal systems (Fig. 4).

5 Symposia held during ICOME 2023

The conference hosted three significant symposia, focusing on current high-experimentation subjects and accurate simulations, facilitating in-depth discussions and advancements:

- **Photonics for Energy** presented by Hassina Derbal Habak This symposium explored the applications of photonics in renewable energy, highlighting advancements in photovoltaic technologies and their potential to improve energy efficiency with invited talk of Prof. Z. Sekkat.

- **Waste-Derived Biomaterials and Biostimulants for Sustainable Agriculture** by Petronia Carillo This session discussed innovative methods for transforming waste materials into valuable agricultural biostimulants, showcasing practical applications that promote sustainability in agriculture.
- **Fire Physics and Simulations** by Sofiane Meradji, Jean-Louis Rossi, and Thierry Marcelli Focused on the dynamics of fire spread and modeling techniques, this symposium provided insights into fire behavior and strategies for improved fire management and mitigation.

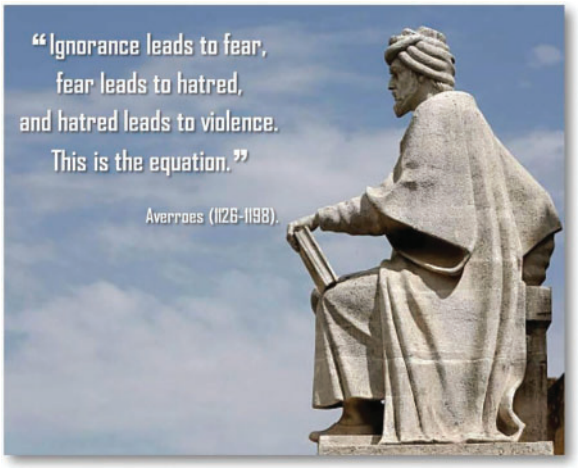

Figure 3: Ibn Rochd of Cordoba (Arabic pronunciation), better known in the Western country by his Latinized name of Averroes, is a 12th-century Arabic-speaking Andalusian Muslim philosopher, theologian, jurist and physician, born 14 April 1126 in Cordoba in Andalusia and died on 10 December 1198 in Marrakech, Morocco

Figure 4: ICOME 2023–Averroes Award to Prof. Yogesh JALURIA in the middle between ICOME Chairs Prof. Bennacer and Prof. El Ganaoui

Acknowledgement: Authors acknowledge the Tech Science Press for the opportunity to edit this special issue of ICOME.

Funding Statement: The authors received no specific funding for this study.

Conflicts of Interest: The authors declare no conflicts of interest to report regarding the present study.