

Prof. Alvin Culaba

De La Salle University Manila, Philippines

Short Bio: Professor Alvin B. Culaba, Ph.D. is the Vice President of the National Academy of Science and Technology, Republic of the Philippines and the Commissioner on Science & Technology, UNESCO National Commission of the Philippines. He had served as Philippine Energy Adviser (2007-2010) and as independent board member of the Philippine Electricity Market Corporation (2014-2016). As an expert panel member of the Philippine Joint Congressional Commission on Science, Technology, and Engineering (COMSTE) he assessed the S&T competitiveness of the energy sector and was commissioned to



undertake energy policy studies that led to the crafting of the country's energy twin-bill, the Biofuels Act of 2006 (RA9367) and the Renewable Energy Act of 2008 (RA9513). A leading researcher in energy and environmental sustainability, he is amongst the top 2% of the world's scientist by Stanford-Elsevier. He sits as editorial board member and reviewer of prestigious international journals. He has delivered numerous keynotes and plenary lectures in international conferences and is a Visiting Scholar to universities in Asia, UK, and the USA. He was a former Executive Vice President of De La Salle University Manila, past Presidents of the National Research Council of the Philippines (NRCP) and the Philippine-American Academy of Science and Engineering (PAASE), USA. He is Distinguished Professor of Mechanical Engineering and Director and co-founder of the Center for Engineering and Sustainable Development Research (CESDR) at De La Salle University Manila.

Talk Title: Implications of the Global Resources Outlook 2024 to Sustainability in the Context of the Philippines

This presentation examines the implications of the Global Resources Outlook 2024 within the context of the Philippines, emphasizing the urgent need for sustainable resource governance, circular economy strategies, and science-driven policy interventions. The presentation highlights how increasing material extraction and consumption contribute significantly to climate change, biodiversity loss, pollution, and resource insecurity, particularly in vulnerable developing countries such as the Philippines. Rapid urbanization, infrastructure expansion, population growth, and increasing energy demand continue to intensify pressures on Philippine ecosystems, food systems, mobility, and energy security.

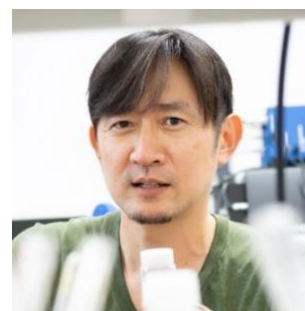
The presentation further discusses the Philippine energy transition, including the country's growing investments in renewable energy, energy efficiency, and low-carbon development pathways aligned with the Philippine Energy Plan and PAGTANAW 2050. Particular attention is given to the importance of integrating Life Cycle

Assessment (LCA), systems thinking, green procurement, and sustainable consumption and production practices into national development planning. The presentation argues that sustainable economic growth and environmental protection can be pursued simultaneously through innovation, circular economy approaches, science-based governance, and inclusive policy reforms. Finally, it emphasizes the critical role of the scientific community, academe, industry, and government collaboration in advancing a resilient, equitable, and sustainability-oriented future for the Philippines.

Prof. Yusuke IDE

Yokohama National University, National Institute for Materials Science (NIMS), Japan

Short Bio: Yusuke Ide is a group leader at the Research Center for Materials Nanoarchitectonics (WPI-MANA), National Institute for Materials Science (NIMS), Japan and a professor of NIMS-YNU joint graduate program, Graduate School of Engineering Science, Yokohama National University (YNU), Japan. He received his Ph.D. from Waseda University in 2007 under the supervision of Prof. Makoto Ogawa. After working as a research associate in his laboratory, in 2010, he moved to Hiroshima University to work as an assistant professor (Prof. Tsuneji Sano's laboratory). Since 2012, he has been working at NIMS. His current interests include the development of high-performance but cost-effective and environmentally friendly materials (e.g., iron-based one) alternative to existing commodities and industrial products. He also tries to synthesize key materials for realizing hydrogen society.



Talk Title: Advancing Sustainability in Sunscreens: Engineering Safer and Efficient UV-Protectants

The increasing awareness of environmental and health concerns associated with conventional sunscreen formulations has driven the search for safer and more sustainable UV-protectants. This workshop presents an overview of emerging strategies in the design of next-generation sunscreen materials, with a focus on integrating iron oxides into clay minerals. Upon the treatment of green rust (GR), an iron hydroxide mineral, with a layered clay via planetary ball milling, GR is altered to transparent UV absorbing elements that are doped in the framework of the clay. These systems offer a versatile platform for stabilizing active iron species, enhancing UV absorption, and improving photostability while minimizing toxicity and environmental persistence. The discussion will highlight how material engineering approaches—ranging from iron content and

intercalation to nanostructuring—can be used to tailor optical properties and performance. Emphasis will be placed on bridging fundamental materials chemistry with practical formulation challenges, addressing issues such as stability, safety, scalability, and regulatory considerations. By connecting recent research advances with industrial and environmental needs, this workshop aims to provide a comprehensive perspective on sustainable UV-protection technologies and foster interdisciplinary dialogue toward safer and more efficient sunscreen solutions.

Dr. Pichaya Pattanasattayavong

Vidyasirimedhi Institute of Science and Technology (VISTEC), Thailand

Short Bio: Dr. Pichaya Pattanasattayavong obtained his PhD in Solid-State Physics from Imperial College London, UK, in 2015. He has since joined VISTEC, first as a Lecturer and promoted to Assistant Professor in 2021. His research focuses on advanced materials for opto/electronic applications. He has won numerous grants and awards, such as Thailand's Young Scientist Award (2020), Outstanding Mid-Career Grant from National Research Council of Thailand (2022), research grant from the US Air Force Office of Scientific Research (2022), Distinguished Lectureship Award from Chemical Society of Japan (2024), and most recently, Thailand's Young Materials Research Award (2024). He is the Co-PI of Thailand's research team in the international project WPlast2H2, supported by the Southeast Asia-Europe Joint Funding Scheme (JFS).



Talk Title: Making Solar Harvesting More Sustainable; Passive Cooling by Hydrogels

Teerapat Lapsirivatkul,¹ Jutamas Sukaim,¹ Daniel Crespy,¹ and Pichaya Pattanasattayavong^{1,*}

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Solar harvesting by photovoltaic (PV) cells has been rising rapidly as the major source of renewable energy. However, the efficiencies of PVs are rarely at the certified level. When operated under full sunlight, the temperature of the cells can exceed 65 °C, and the power output drops by >15% relatively. Various cooling techniques have been devised to tackle this issue. Passive cooling strategies are promising as they do not require power input which would otherwise trade-off with the generated energy. Usually passive cooling relies on phase-change materials (PCMs) that dissipate heat by solid-liquid phase transformation. However, their weight is substantial, and the liquid form necessitates additional containing structures. Herein, we present thermoresponsive hydrogels based on poly(*N*-isopropylacrylamide) (PNIPAM) having a semi-interpenetrating network with poly(acrylamide) (PAM), a hydrophilic polymer, for PV cooling. When the temperature rises, the hydrogels rapidly shrink and release water for evaporative cooling. We show that the cooling performance is based not only on the amount

of absorbed water, but also on the rate of water release. The latter effectively determines the cooling power of the hydrogels. PNIPAM/PAM hydrogels with 15 wt.% of PAM yield the highest swelling ratio of 30 and highest specific cooling power of 1.86 W g^{-1} . By placing the free-standing hydrogels directly on the back side of silicon PVs, the temperature is reduced from 70 to 47 °C when tested under 1-sun, and the efficiency is restored by a relative 12.3%. Crucially, only approximately 5 kg m^{-2} of PNIPAM/PAM hydrogels is required to achieve this level of cooling, which is around 90% lighter than the weight of PCMs typically required to reach the same performance. In other words, this simple cooling method by our lightweight hydrogels can recover >10% of lost energy, making solar harvesting even more sustainable.

Associate Prof. Ugur Unal

Koç University, Istanbul, Türkiye

Short Bio: Ugur Unal is professor of Chemistry Department at Koc University. He also serves as the director of Koc University Surface Science and Technology Center (KUYTAM). His current research interests are 1) Synthesis and applications of 2D layered materials and high-entropy materials, 2) photocatalytic energy conversion 3) electrocatalytic energy conversion 4) understanding the charge transfer mechanism at the catalyst surface.



Talk Title: Beyond Noble Metals: High-Entropy Materials as Robust Catalysts for Sustainability

The transition to sustainable energy and chemical systems demands catalysts that are efficient, durable, and composed of earth-abundant elements. Conventional noble metal catalysts are limited by scarcity, cost, and instability under harsh conditions. This presentation highlights recent work on high-entropy materials (HEMs) as a versatile alternative platform for catalysis.

HEMs, including alloys and oxides, exhibit high configurational entropy that stabilizes single-phase structures and enhances resistance to sintering, corrosion, and phase segregation. Their multi-element compositions enable tunable electronic structures and active sites, offering a powerful route to optimize catalytic performance.

This talk highlights structure–property–performance relationships in high-entropy catalysts for key sustainability reactions, including hydrogen evolution, oxygen reduction, and carbon-based conversions. Overall, high-entropy materials emerge as robust, scalable catalysts, demonstrating how compositional complexity can enable efficient and economically viable solutions for sustainable technologies.

Dr. Şenol Pişkin

Department of Industrial Engineering, Istinye University, Istanbul, Türkiye

Short Bio: Dr. Şenol Pişkin is a researcher and Principal Investigator at Istinye University, where he leads the ISU XR Lab and CARE Labs. His multidisciplinary research focuses on the intersection of Extended Reality (XR), Artificial Intelligence (AI), computational science, robotics, and medical technology. Dr. Pişkin specializes in developing advanced computational models and immersive technologies to address complex engineering and healthcare challenges. He is actively engaged in directing high-impact research initiatives and is deeply involved in preparing and executing projects supported by prominent funding frameworks, including TÜBİTAK and Horizon Europe. Through his leadership, his research groups are dedicated to leveraging AI, advanced simulations, and digital twin ecosystems to drive technological innovation and foster practical, sustainable solutions. <https://care-labs.net>



Talk Title: Digital Twin Ecosystems for Sustainability: A Convergence of Computational Science, AI and XR

The transition toward global sustainability demands innovative tools capable of modeling, predicting, and optimizing complex physical and technological systems. This talk explores the transformative paradigm of Digital Twin ecosystems, highlighting the critical convergence of Computational Science, Artificial Intelligence (AI), and Extended Reality (XR). By coupling high-fidelity computational models with AI-driven analytics, digital twins allow for real-time monitoring, predictive maintenance, and significant resource optimization, directly minimizing environmental impact and material waste. Furthermore, XR technologies serve as the vital human-in-the-loop interface, granting researchers and stakeholders immersive environments to intuitively interact with and visualize complex data streams. Drawing on multidisciplinary frameworks, this presentation will demonstrate how the synergy of these cutting-edge technologies accelerates the development and deployment of sustainable solutions. Ultimately, bridging the gap between virtual simulations and real-world execution offers a scalable blueprint for sustainable engineering, resilient systems, and advanced technological innovation.

Dr. M Hussein N. Assadi

RIKEN Center for Emergent Matter Science (CEMS), 2-1 Hirosawa, Wako, Saitama 351-0198, Japan

Chemistry Department, Faculty of Engineering and Natural Sciences, Istinye University, Istanbul, Türkiye

Short Bio: Dr. Hussein Assadi was educated at Charles Sturt University and the University of New South Wales, Australia. He has worked in Japan at Osaka University as a JSPS Fellow (2013–2015), the National Institute for Materials Science (2016–2019), and RIKEN (2022–present). A materials scientist by training, he is passionate about understanding nanoscale fundamentals to improve human health and the environment. He is particularly interested in the potential of artificial intelligence, data science, and quantum chemistry in addressing environmental challenges. His current research focuses on advancing nanomaterials for green energy, healthcare, waste reduction, and developing safer alternatives to harmful compounds. He has authored more than 100 scientific articles and presented invited talks at more than 20 international conferences.



Talk Title: Advancing Atom Economy and Sustainability through Computational Materials Science

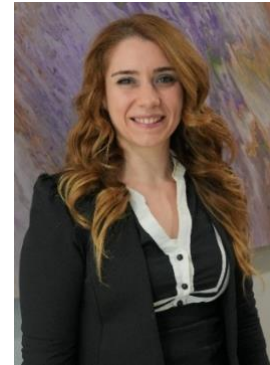
Atom economy, often referred to as atom efficiency, is a fundamental green chemistry principle defined as the proportion of atoms from the reactants that are successfully incorporated into the desired final product. It is crucial because high atom economy minimizes the generation of hazardous by-products, reduces resource depletion, and enhances the economic and environmental sustainability of chemical synthesis. By designing reactions that maximize yield while minimizing waste, this metric helps align industrial processes with broader sustainability goals. Despite its importance, further research is required to overcome persistent challenges in scalability and reproducibility, particularly when transitioning from laboratory-scale experiments to industrial manufacturing. Current efforts are focused on developing more efficient, selective catalytic systems and integrating AI-driven predictive modeling to optimize reaction conditions. Here, we will showcase how computational materials science enables

support-engineered catalysis, in which Pd usage is minimized through stabilization, dispersion, and cooperative reactivity, key pillars of atom-economical catalyst design. [<https://doi.org/10.1002/admi.20220236>].

Assoc. Prof. Dr. Saliha Karadayi-Usta

Faculty of Engineering and Natural Sciences, Istinye University, Türkiye

Short Bio: Saliha Karadayı Usta graduated from the Industrial Engineering Undergraduate Program with an honour degree in 2012. She completed her Master's degree in Industrial Engineering at Istanbul Technical University (ITU) in 2014, with a thesis focused on risk analysis in service supply chains. She subsequently earned her PhD in Industrial Engineering from ITU in 2020, conducting research on the design of medical tourism service supply chains. Between 2013 and 2020, she served as a research assistant in the Department of Industrial Engineering at ITU. She was appointed Assistant Professor in 2020 and promoted to Associate Professor in 2023. Since 2022, she has been a faculty member in the Department of Industrial Engineering at Istinye University. Since February 2023, she has served as the Head of the Department of Industrial Engineering at Istinye University, and since October 2023, she has held the position of Vice Dean for Research at the Faculty of Engineering and Natural Sciences. She has been a member of the Editorial Board of the Sustainability section of Scientific Reports (Nature Portfolio) since September 2023, and a member of the Editorial Board for the Business, Environmental Studies, Tourism and Hospitality, and Risk Management sections of Humanities & Social Sciences Communications (Nature Portfolio) since June 2025. Since June 2025, she has also served as a Corporate Sustainability System Mentor within the Turkish Exporters Assembly, providing consultancy services to the sector. Between November 2023 and August 2025, she was a member of the Entrepreneurship and Incubation Center Commission at the İstinye Garage Incubation Hub. In addition, she has been a member of the Technology Advisory Board of Bilişim Vadisi since July 2023. Her research interests include sustainability, Industry 4.0 and digital transformation, supply chain management, and risk analysis.



Talk Title: Integrating Sustainability and Digital Transformation: Smart Practices Across Industries

As the global industrial landscape shifts towards the concept of sustainability and its crucial integration with digital transformation, there is a pressing need to design and analyze smart and sustainable solutions for different sectors. This session explores innovative applications and smart practices across multiple industries, including agriculture, automotive, construction,

energy, healthcare, textiles, transportation, mining, and information technologies. This session will discuss how to design and implement sustainable solutions that address modern challenges, using both theoretical foundations and practical examples. Ultimately, this session aims to explain the environmental, economic, and social impacts of sustainability and highlight strategies to manage these impacts within a rapidly evolving digital world.

Dr. Esmail Doustkhah

Clean Energy Research Center (TEAM), Istinye University, Türkiye

Short Bio: Dr. Esmail Doustkhah is an Assistant Professor in the Department of Chemistry at Istinye University, Istanbul, Türkiye, and currently serves as the Director of the Clean Energy Research Center (TEAM). He received his Ph.D. in 2017 and has held prestigious international fellowships, including the Marie Skłodowska-Curie Fellowship at Koç University and the JSPS Fellowship in Japan, conducting research at institutions such as the National Institute for Materials Science (NIMS). His research focuses on photocatalysis, photoelectrocatalysis, and the design of advanced functional materials—including porous layered materials, metal oxides, perovskites, and heterostructures—for sustainable energy applications. He has coordinated and contributed to multiple national and international projects, including TÜBİTAK 1071 and EU-LAC collaborations, and is actively engaged in advancing photocatalytic systems with improved efficiency, stability, and scalability. In addition to his research, he serves as an Early Career Editor for Applied Catalysis O: Open and as an editor for BMC Chemistry.



Talk Title: From Waste to Wealth: Sustainable Upcycling

The shift toward a circular economy requires transformative approaches that convert waste into high-value functional materials, enabling both environmental sustainability and economic benefit. This work provides a comprehensive overview of sustainable upcycling strategies, emphasizing the conversion of waste streams such as plastics and industrial by-products into advanced porous and layered materials with tunable physicochemical properties. By integrating bottom-up synthesis, defect engineering, and nanostructuring, alongside machine learning and density functional theory for predictive design, high-performance catalysts and photoactive systems can be developed. Particular focus is placed on mesoporous layered carbon nitrides, vanadate thin films, and hybrid heterostructures, where waste-derived components enhance crystallinity, conductivity, and catalytic activity. These materials are applied in green hydrogen production through photocatalytic and photoelectrochemical water splitting, as well as in CO₂ conversion and environmental remediation, with strategies such as plasmonic metal loading and single-atom catalysis improving charge separation and stability. Aligned with ongoing international research efforts, this approach demonstrates how waste

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can be transformed into valuable resources, offering scalable and cost-effective solutions that bridge waste management and clean energy technologies.