Hydrogen Technologies Association

BULLETIN

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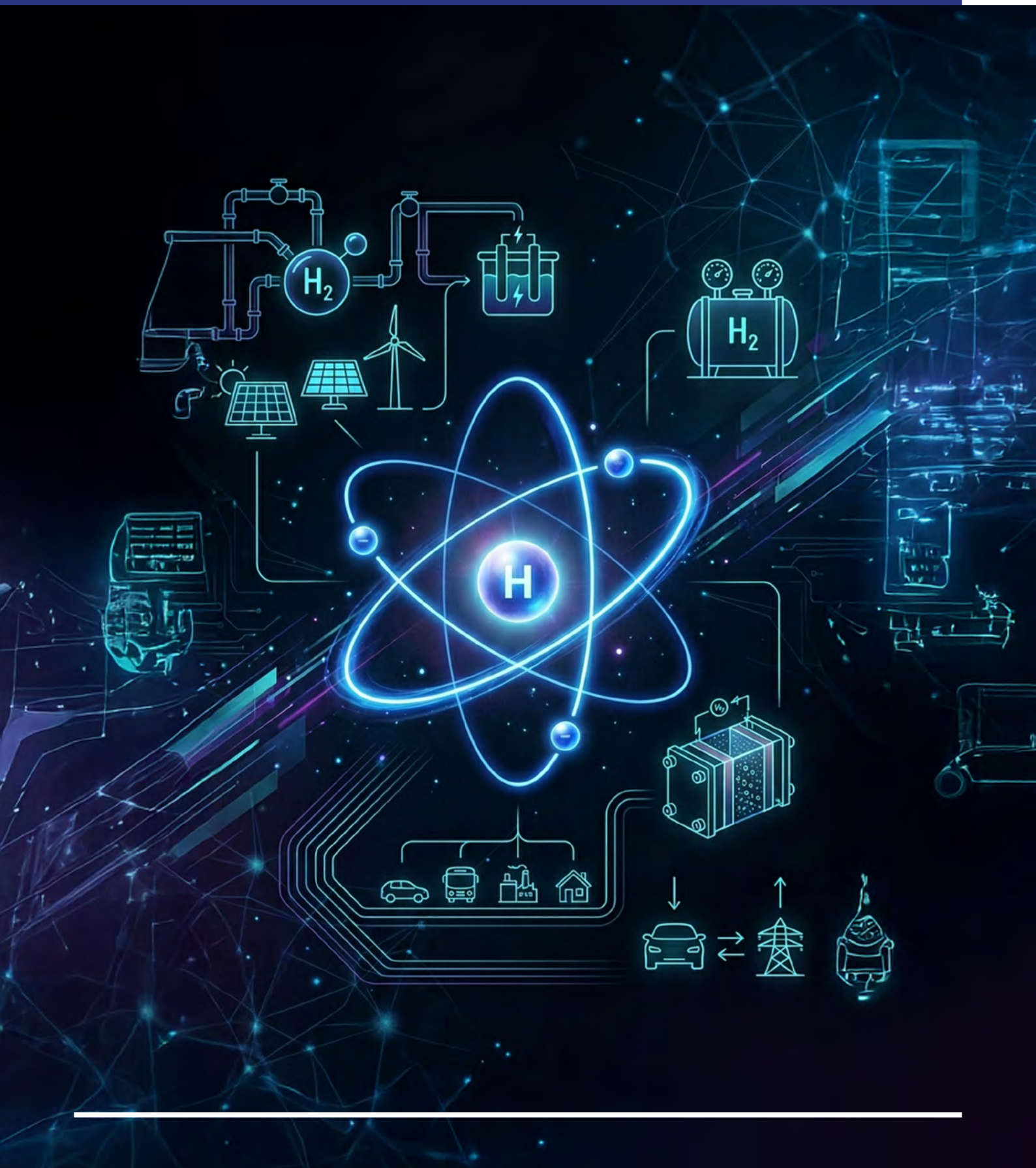

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MESSAGE FROM THE PRESIDENT

Dear Members, Esteemed Stakeholders, and Distinguished Readers,

I am pleased to reconnect with you in the March 2026 issue of the Hydrogen Technologies Association e-bulletin. At a time when the global energy transition is accelerating and climate targets are becoming clearer and more binding, hydrogen technologies are not merely a technical field but a strategic instrument of transformation.

Our Association continues its mission of building a strong bridge between scientific knowledge production and industrial applications with determination. With our renewed board and editorial structure, we aim to foster a more inclusive, interdisciplinary, and internationally engaged platform. In this regard, we will continue to expand our efforts by addressing academic depth and sectoral applicability together.

One of the most significant scientific gatherings of this year, the 10th International Hydrogen Technologies Congress (IHTEC-2026), will be held on May 10–13, 2026, hosted by Istinye University. IHTEC-2026 will comprehensively address critical topics such as hydrogen production, storage, fuel cells, energy conversion, safety, regulations, and the future of the hydrogen economy. We view this congress not only as an academic meeting but also as a platform for fostering R&D collaborations, technology transfer, and strategic partnerships.

Through the IHTEC 2026 Awards, we will continue to honor distinguished scientists who have dedicated many years to the hydrogen field, institutions that develop innovative technologies, and our young researchers. Encouraging young talent to engage in this field and strengthening qualified human resources are indispensable for building a sustainable hydrogen ecosystem.

The biohydrogen production report featured in this issue once again highlights the importance of alternative and renewable hydrogen sources. Processes such as dark fermentation, photofermentation, and biophotolysis hold significant potential, particularly within carbon-neutral and circular economy-oriented systems. However, it is evident that beyond technical efficiency, we must adopt a holistic approach that also addresses scalability, safety, and economic feasibility.

The 11th Istanbul Carbon Summit, an important platform in the fight against climate change and the decarbonization agenda, will further enhance the visibility of hydrogen's role in energy systems. Hydrogen stands at the center of carbon markets, low-carbon production strategies, and industrial transformation.

In terms of academic collaboration, the ECO-SPHERE Program conducted in partnership between Yıldız Technical University and Dokuz Eylül University represents a significant initiative that will strengthen our country's research capacity in clean energy and circular economy at an international level. Such programs will further reinforce the scientific foundation of hydrogen-based systems.

The Koç University Hydrogen Technologies Center (KUHyTech), aims to contribute scientifically to Türkiye's 2053 net-zero carbon targets while providing an important research infrastructure for the development and advancement of hydrogen technologies. In particular, activities related to the production, storage, transportation, and commercialization of green hydrogen are expected to play a critical role in Türkiye's energy transition.

From an industrial perspective, organizations such as WIN EURASIA 2026 offer critical opportunities for integrating hydrogen into the production ecosystem through themes such as energy automation, digitalization, and industrial transformation. The widespread adoption of hydrogen technologies will not be limited to the energy sector; it will drive transformation across many fields, from transportation to heavy industry.

Major contributions to the energy literature, such as *Comprehensive Energy Systems and Sustainable Production of Microalgae Biomass as a Biodiesel Feedstock*, demonstrate the decisive role of knowledge generation and academic depth in this transformation.

The energy systems of the future must be efficient, safe, integrated, and low-carbon. Hydrogen will serve as a strategic energy carrier at the heart of these systems. However, success will only be possible through the simultaneous advancement of scientific research, engineering applications, sound policy frameworks, and strong industrial collaborations.

As an Association, our goal is to contribute to positioning Türkiye as a regional hub and a global actor in hydrogen technologies. In this regard, I invite all our members, researchers, industry representatives, and young professionals to produce, develop, and transform together.

I wish that our March issue will be productive and inspiring for you all, and I look forward to meeting you at IHTEC-2026.

Sincerely,

Prof. Dr. İbrahim Dinçer
Hydrogen Technologies Association
Chairman of the Board

LETTER FROM EDITOR

Dear Readers,

It is a great pleasure to meet you again in the March 2026 issue of the Hydrogen Technologies Association e-bulletin.

First and foremost, I would like to express my sincere gratitude to our former Editor, Prof. Dr. İnci Eroğlu, for her valuable contributions, scientific rigor, and dedicated efforts in advancing our e-bulletin. Her transition to our Editorial Board, where she will continue to contribute her knowledge and experience in a new capacity, is a significant gain for our publication. I would also like to extend my appreciation to the esteemed editorial team who worked alongside her for their contributions to our association's publications.

With our new management and editorial board, we continue our journey with a publication approach that aims to further strengthen scientific content and enhance national and international engagement. The strengthening of our Editorial Board enriches our interdisciplinary perspective.

In this issue, we witness once again the dynamic progress of the hydrogen ecosystem at both scientific and institutional levels.

The 10th International Hydrogen Technologies Congress (IHTEC-2026), to be held in Istanbul on May 10–13, 2026, hosted by Istinye University, will serve as an important international platform bringing together representatives from academia, industry, and the public sector working in the field of hydrogen technologies. Topics ranging from green and blue hydrogen production to storage and fuel cells, from energy policies to industrial applications, will make significant contributions to our country's hydrogen vision.

We also continue to honor scientific and technological achievements through the IHTEC 2026 Awards. From the Nejat Veziroğlu Special Award to the Young and Student Researcher Awards, this structure serves as an important source of motivation for researchers working toward sustainable development goals.

In this issue, we also present a comprehensive review on biohydrogen production. Covering processes such as dark fermentation, photofermentation, and biophotolysis, as well as nanomaterial-supported efficiency enhancement strategies, this study highlights the strategic importance of biohydrogen for sustainable, low-carbon energy systems. Scalability, economic feasibility, and safety considerations remain critical discussion points for the future of the technology.

The 11th Istanbul Carbon Summit, one of the key events in climate technologies and decarbonization, is also featured in this issue. Discussions on carbon markets and climate technologies will further highlight the role of hydrogen-based energy systems in the transformation process.

In academia, the ECO-SPHERE Program, carried out in partnership between Yıldız Technical University and Dokuz Eylül University, stands out. Supported by the European Union's Marie Skłodowska-Curie COFUND program, this initiative brings international researchers to our country in the fields of environmental sciences and circular economy, while also strengthening our scientific capacity in hydrogen and clean energy.

The Koç University Hydrogen Technologies Center (KUHyTech) was established in January 2024 as a research center. The center aims to contribute to Türkiye's 2053 net-zero carbon targets and support the development of hydrogen technologies. Activities focused on the production, storage, and commercialization of green hydrogen are expected to play significant roles in developing technologies that will support Türkiye's energy transition and in training young researchers in this field.

We would like to thank Prof. Dr. Ibrahim Dincer, Prof. Dr. Güleda Engin, Prof. Dr. Azize Ayol, Prof. Dr. Can Erkey, Dr. M. Iberia Aydın, and Dr. Tasnim Almoulki for their contributions to this issue with their articles. Their valuable contributions have significantly enriched the scientific content of our bulletin.

On the industrial and technological front, WIN EURASIA 2026 sheds light on the future of production technologies through themes such as automation, energy infrastructure transformation, and digitalization. Energy automation and data-driven systems play a critical role in the integration of hydrogen-based industrial applications.

The inclusion of OBA Perdesan among our corporate members, with its R&D vision extending from technical textiles to clean energy systems, represents a concrete example of the strong link between the hydrogen ecosystem and industry. Its fuel cell component development projects demonstrate the private sector's commitment in this field.

In this issue, we also introduce two important scientific works. *Comprehensive Energy Systems* provides a holistic approach to energy systems, making a strong contribution to the literature, while *Sustainable Production of Microalgae Biomass as a Biodiesel Feedstock* offers up-to-date and application-oriented perspectives on microalgae-based biofuel production and sustainable energy integration.

All these developments clearly demonstrate that hydrogen is not merely an energy carrier, but also a strategic component of climate-friendly transformation, industrial decarbonization, and sustainable development. Coordinated efforts among academia, industry, public institutions, and civil society will further strengthen our country's position in this field.

We would like to thank Prof. Dr. Ibrahim Dincer, Prof. Dr. Can Erkey, Dr. Tasnim Almoulki, Prof. Dr. Azize Ayol, Prof. Dr. Güleda Engin, and Dr. M. Iberia Aydın for their contributions to this issue with their articles. Their valuable contributions have significantly enriched the scientific content of our bulletin.

I hope that our March issue will serve as a guiding resource for our valued members, researchers, and sector representatives, and I look forward to meeting you at IHTEC-2026 and our other upcoming events.

Sincerely,

Prof. Dr. Aysel Kantürk Figen

10th International Hydrogen Technologies Congress (IHTEC-2026) - Istanbul

The 10th International Hydrogen Technologies Congress (IHTEC-2026), to be held on May 10–13, 2026 in Istanbul and hosted by Istinye University, is preparing to bring together representatives from academia, industry, and the public sector working in the field of hydrogen technologies under one roof.

Organized by Istinye University and the Hydrogen Technologies Association, IHTEC-2026 is a prestigious international and interdisciplinary scientific platform aimed at contributing to the sustainable development of the hydrogen economy. The congress will provide a broad framework for knowledge exchange and collaboration, ranging from fundamental sciences to engineering applications, and from pilot-scale production to industrial integration.

The main themes to be addressed within the scope of the congress include:

- Hydrogen production technologies (green, blue, and alternative production methods)
- Storage and transportation systems
- Fuel cells and energy conversion technologies
- Safety, standards, and regulations
- Industrial applications and scalability
- Energy policies and the future of the hydrogen economy

Through keynote speeches by leading experts, technical sessions, industry-focused panels, and project presentation platforms, participants will have the opportunity to access the latest scientific findings, develop R&D collaborations, and explore technology transfer opportunities.

IHTEC-2026 is not only an academic gathering; it also serves as a strategic networking and business development platform for companies operating in the fields of energy, defense, transportation, chemistry, heavy industry, and clean technologies. We invite industry representatives, investors, start-up initiatives, and public institutions to take part in this global platform.

The historical and cultural richness of Istanbul, located at the intersection of two continents, will add an international dynamism to the congress.

Mark your calendar now and become part of this global gathering that will shape the future of hydrogen technologies!

IHTEC 2026 Awards

Organized by the Hydrogen Technologies Association (HTA), the IHTEC Awards are presented annually within the scope of the International Hydrogen Congress (IHTEC) to honor outstanding scientific, technological, and industrial contributions in the field of hydrogen energy. The awards aim to encourage individuals and institutions contributing to sustainable development and climate-friendly transformation.

Applications and nominations will be submitted through the official website of the Association. The evaluation process will be conducted by an independent and international jury in accordance with transparency and academic standards. Award recipients will be invited to the official IHTEC Award Ceremony, with congress registration and accommodation expenses covered by the Association.

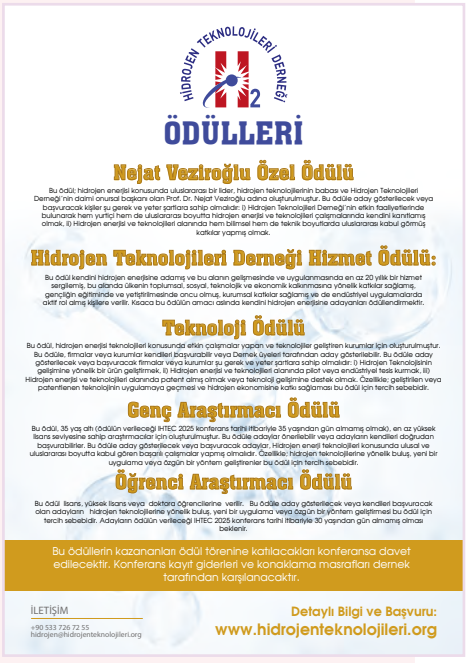
We invite you to apply for the IHTEC 2026 Awards and join us in shaping the future of hydrogen energy.

Hydrogen Technologies Association
IHTEC Awards Committee

For more information:

Award Categories

- **Nejat Veziroğlu Special Award:** Presented to individuals who have pioneered the international advancement of hydrogen technologies
- **Technology Award:** Granted to institutions or companies developing innovative products, facilities, or patented solutions
- **HTA Service Award:** Presented to individuals or institutions with at least 20 years of dedicated service in the hydrogen field
- **Young Researcher Award:** For researchers under the age of 35 with outstanding and original contributions
- **Student Researcher Award:** For undergraduate, master's, or PhD students under the age of 30



Biohydrogen Production: From Metabolic Routes to Sustainable Applications and Emerging Technologies

Biohydrogen production has emerged as a promising option for sustainable and renewable energy generation; by providing an alternative to fossil fuels, it plays a significant role in meeting the increasing global energy demand and mitigating environmental problems. For this reason, this study comprehensively addresses the current status of biohydrogen production technologies, focusing on metabolic processes and recent advancements.

The main metabolic pathways—dark fermentation, photofermentation, and biophotolysis (including both direct and indirect photolysis)—are examined, and their biochemical mechanisms, operational parameters, and efficiencies are discussed in detail. In particular, the integration of additives such as nanomaterials has been evaluated as an innovative strategy to enhance hydrogen production efficiency by increasing microbial activity and process stability.

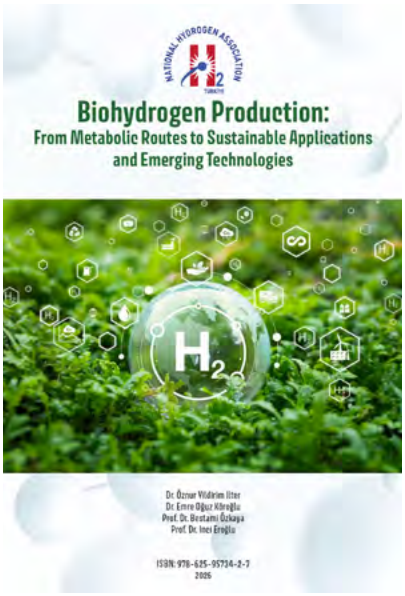
In addition to biohydrogen production processes, technical and safety aspects, as well as storage challenges that are critical for large-scale applications, are also addressed. The applications of biohydrogen across various industrial sectors are examined, emphasizing its versatility and potential role in establishing low-carbon energy systems.

Furthermore, the sustainability dimension of biohydrogen production is analyzed, including its socio-economic impacts, carbon footprint reduction potential, and long-term feasibility within the framework of the circular economy. Various studies presenting successful implementations and projects are included, highlighting practical applications and operational outcomes.

The study also discusses current challenges such as process optimization, scalability, and economic feasibility, along with solution proposals in light of recent research. In conclusion, future opportunities in biohydrogen production are addressed in this report within the context of innovative reactor designs, integrated systems, and policy frameworks that will support the widespread adoption of these technologies in the global energy transition.

You can access detailed information at the following link:

https://www.hidrojenteknolojileri.org/category/raporlar/



11TH ISTANBUL CARBON SUMMIT

The 11th Istanbul Carbon Summit, for which the Hydrogen Technologies Association is a supporting non-governmental organization, will be held on May 4–5, 2026 at the ITU Süleyman Demirel Cultural Center under the main support of the Ministry of Environment, Urbanization and Climate Change and Istanbul Technical University (ITU). The summit will be organized by the Sustainable Production and Consumption Association (SÜT-D) under the theme "Decarbonization, Carbon Market and Climate Technologies."

The 2026 SÜT-D Low Carbon Hero Award Ceremony will also take place during the summit.

Information, Registration, and Award Application:

https://www.karbonzirvesi.com;

info@inppes.com

GREEN TRANSFORMATION AWARD

At the Female Founders Türkiye Awards, first held in 2025 to honor women's creativity, courage, and contributions to society, Prof. Dr. Filiz Karaosmanoğlu—Faculty Member at Istanbul Technical University, President of the Sustainable Production and Consumption Association, and Founding Board Member of the Hydrogen Technologies Association—was awarded the Green Transformation Project Award.

At the ceremony held on November 3, 2025, a total of 21 women were honored in various categories including academia, sustainability, and business.

The award was presented to Prof. Karaosmanoğlu in recognition of her efforts to bridge science and practice by building strong connections between environmental awareness, clean production, and the circular economy; guiding institutions through innovative projects; encouraging individuals to actively embrace a sustainable lifestyle; and transforming "Green Transformation" from a concept into a way of life through her work.

ECO-SPHERE: Fostering Research Talents in the Circular Economy

Tasnim Almoulki[1], Azize Ayol[2] ve Güleda Engin[1]

[1] Yildiz Technical University, Environmental Engineering Department, Esenler, 34220, Istanbul Turkiye
[2] Dokuz Eylul University, Environmental Engineering Department, Tinaztepe, 35390, Izmir, Turkiye

This project has received funding from the European Union's Horizon Europe research and innovation program under the Marie Skłodowska Curie Grant Agreement No. 101129555. See this project on Cordis.

The project has also received funding from The Scientific and Technological Research Council of Türkiye under the scope of Agreement No. 123C459.

The ECO-SPHERE Postdoctoral Researcher Program, carried out in partnership between Yıldız Technical University (YTÜ) and Dokuz Eylül University (DEÜ), has been launched with an approximate budget of 3 million Euros, supported by the European Union's Marie Skłodowska-Curie COFUND program and TÜBİTAK.

The transition towards a sustainable future with climate-neutral energy systems requires not only technological innovation, but also a robust, internationally connected research community capable of working together and addressing complex environmental and energy challenges. This is where ECO-SPHERE, an international Postdoctoral Fellowship Programme for Circular Economy and environmental studies, comes to play an important role in strengthening scientific capacity and fostering interdisciplinary research aligned with Europe's green transition.

ECO-SPHERE was implemented in 2024 with the support of the Marie Skłodowska-Curie Actions (MSCA) COFUND scheme under the Horizon Europe Framework Programme for Research and Innovation and TÜBİTAK. Coordinated by Yildiz Technical University and Dokuz Eylul University, the programme aims to recruit 24 international researchers with outstanding talents and provide them with unique experience in a research environment focused on circular economy, sustainability, and clean energy technologies.

By supporting highly qualified researchers with solid backgrounds, ECO-SPHERE contributes to global sustainable development and environmental resilience. Throughout the extensive 5-year programme, our fellows carry out innovative research while benefiting from structured training, collaborating with local and global experts, and undertaking distinguished secondments with academic and non-academic partners. By integrating scientific excellence with real-world challenges, the programme contributes to strengthening Türkiye's research and innovation ecosystem while promoting widespread knowledge exchange.

Within the broad research framework of ECO-SPHERE, several scientific projects tackle serious challenges in clean energy and hydrogen technologies. These projects explore new solutions that help build future hydrogen ecosystems and energy infrastructures. For example, current research by ECO-SPHERE fellows includes studies on the best design for regional hydrogen and synthetic fuel production systems in Türkiye. This research considers the renewable energy potential of various provinces. Other studies investigate new methods for producing and storing green hydrogen within modern integrated energy systems, aiming to improve efficiency, scalability, and system resilience.

Moreover, ECO-SPHERE fellows are developing planning frameworks to integrate green hydrogen technologies into electricity distribution networks supported by artificial intelligence. Such work contributes to addressing emerging challenges related to grid flexibility, infrastructure planning, and the integration of hydrogen technologies within evolving energy systems.

By supporting such promising efforts in science and research, ECO-SPHERE is on a mission to advance knowledge in sustainability, clean energies, and emerging hydrogen technologies and to become prominent in the field of circular economy and support Türkiye's transition towards an eco-friendly future.

Management and Coordination

Within the Program Management Committee, Prof. Dr. Güleda Engin, Vice Rector responsible for research planning at YTÜ, serves on behalf of YTÜ. On the DEÜ side, Prof. Dr. Azize Ayol acts as Vice Coordinator of the program and plays an active role in academic coordination and the management of inter-university collaborations.

ECO-SPHERE and Hydrogen Perspective

Although ECO-SPHERE is structured around environmental sciences and circular economy, research to be developed in areas such as sustainable energy transition, clean production technologies, and hydrogen-based systems holds direct potential to contribute to Türkiye's green transformation goals. By promoting international researcher mobility, the program aims to strengthen the scientific capacity of the country's hydrogen and clean energy ecosystem.

Internationally recognized academics in the fields of energy transition and hydrogen technologies play an active role in the scientific guidance and strategic development processes of the ECO-SPHERE Program. Program advisors include Prof. Dr. Ibrahim Dincer, President of the Hydrogen Technologies Association; board members Prof. Dr. Can Ozgur Colpan and Prof. Dr. Aysel Kanturk Figen; and association member Prof. Dr. Mehmet Akif Ezan.

They contribute to the program's research focus particularly in clean energy systems, hydrogen production and storage technologies, energy efficiency, carbon reduction strategies, and sustainable industrial transformation. In this context, ECO-SPHERE provides not only a platform for circular economy research but also a strong interdisciplinary academic foundation for the development of hydrogen-based energy systems.

WIN EURASIA 2026: “Go Further with Automation”

WIN EURASIA Automation and Machine Technologies Fair will be held for the 32nd time on June 10–13, 2026, at the Istanbul Expo Center. Organized by Hannover Fairs Turkey, the event will bring together hundreds of companies and thousands of industry professionals across six halls covering a total exhibition area of 55,000 m².

Under the motto “Go Further with Automation,” WIN EURASIA 2026 will focus on electrical and electronic power transmission and distribution, energy automation, industrial and factory automation, robotics and digital factories, welding and machinery technologies, as well as compressor and compressed air systems. IoT, 5G, and artificial intelligence integrations will also be among the key highlights of the exhibition.

The transformation of energy infrastructure will be one of the central themes of the fair. In response to rising energy costs, the integration of renewable energy sources, and the growing need for data-driven management, energy automation will be addressed as a strategic component of modern manufacturing.

Special experience zones such as the Industrial IoT Area, 5G Arena, Industrial Artificial Intelligence Area, and Power Transmission Area will offer visitors interactive technology demonstrations.

Having attracted strong international participation in previous editions—including companies and visitors from Germany, Italy, India, China, and Japan—WIN EURASIA aims to once again bring together global industry leaders in Istanbul in 2026.

WIN EURASIA 2026 will provide a 360-degree perspective on the manufacturing industry and offer a unique opportunity to explore the technologies shaping the future of production.

Energy, Water, and Hydrogen Integration Project in Partnership between Hamad Bin Khalifa University and Yıldız Technical University

Dr. M. İberia Aydın
Yıldız Technical University

جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY
عضو في مؤسسة قطر
Member of Qatar Foundation

The project titled *“Salt-Based Cooling and Wastewater/Brine Reuse by Photo-Electrodialysis for Hydroponic Greenhouses”* is supported by the Qatar Research Fund Foundation and is led by Yusuf Bicer from Hamad Bin Khalifa University, Qatar. In the project, Nadir Javani from Yıldız Technical University serves as the principal investigator, while Muhammed Iberia Aydın participates as a researcher.

The project aims to make greenhouse agriculture more sustainable and efficient under Qatar’s arid climate conditions. In desert climates, reducing greenhouse temperatures to levels suitable for plant growth requires high energy consumption. This increases costs and leads to excessive use of resources. Within the scope of the project, a salt-based cooling system is being developed based on the principle that endothermic salts absorb heat from the surroundings during dissolution in water. Through this approach, the energy consumed for greenhouse cooling is expected to be significantly reduced, aiming to establish a more economical and environmentally friendly production model.

In addition, the project utilizes a solar-powered photo-electrodialysis (FED) process to treat wastewater and make it reusable for agricultural irrigation. This process not only removes pollutants but also enables the recovery of valuable nutrients such as nitrate, phosphate, and potassium, thereby reducing the need for fertilizers. Hydrogen gas produced as a by-product can also be utilized as an energy source.

Through the integration of salt-based cooling and PED-based water recovery systems, the project aims to reduce energy consumption in greenhouse agriculture, conserve water resources, and strengthen food security.

Koç University Hydrogen Technologies Center (KUHyTech)

Prof. Dr.Can Erkey

Koç University - Department of Chemical and Biological Engineering and Director of Koç University Hydrogen Technologies Center (KUyTech)

The Koç University Hydrogen Technologies Center (KUHyTech) is an interdisciplinary center of excellence established in January 2024 with the strong support of Koç Group companies and granted the status of a "Research Center" by the Council of Higher Education (YÖK). The center was founded to contribute scientifically to Türkiye's 2053 net-zero carbon targets. In the ongoing global energy transition, hydrogen plays a critical role in the decarbonization of industry, integration of renewable energy, and enhancement of energy security. Activities related to the production, storage, transportation, and commercialization of green hydrogen are expected to play a crucial role in Türkiye's energy transition. Through strong collaborations with industrial stakeholders, KUHyTech aims to maximize industry–academia interaction. While advancing the scientific foundations of hydrogen technologies, the center also adopts a holistic research approach that aims to ensure their applicability at an industrial scale.

Within the center, approximately 15 academics from the departments of chemical engineering, materials science and engineering, physics, chemistry, and mechanical engineering come together, each with expertise in their respective fields. This structure establishes a research ecosystem extending from fundamental sciences to applied engineering, providing research capacity across a wide spectrum—from molecular-level phenomena to system integration.

The research activities of KUHyTech are structured around three main axes:

1. Production Technologies

At KUHyTech, research is conducted on electrolyzer design for green hydrogen production with the aim of both improving existing technologies and developing new electrolyzer concepts. In this context, through design and materials development studies, the reduction of hydrogen production costs, improvement of efficiency, and reliable operation are targeted.

Within the scope of a project carried out in collaboration with Tüpraş R&D, NiFe oxide-based OER catalysts and high-entropy alloy (HEA) thin film structures are being developed on the anode side of an anion exchange membrane (AEM) water electrolyzer as alternatives to Ir-based catalysts, while on the cathode side, two-dimensional supported MPt (M = Fe, Co, Ni, Cu) nanoalloy HER electrocatalysts are being developed to reduce Pt loading. Commercial anion exchange membranes are characterized in different alkaline electrolytes by measuring fundamental properties such as water uptake and ionic conductivity, and the findings serve as a basis for new membrane synthesis studies. In order to effectively translate the performance of the synthesized catalysts into cell performance, various catalyst ink formulations that can establish an appropriate electrode–membrane interface are being investigated. The project aims to integrate the developed components to produce cells with performance superior to commercial AEM cells capable of operating under 40 bar conditions. Based on the cell results, feasibility analyses and modeling studies will be conducted for the development of AEM stacks.

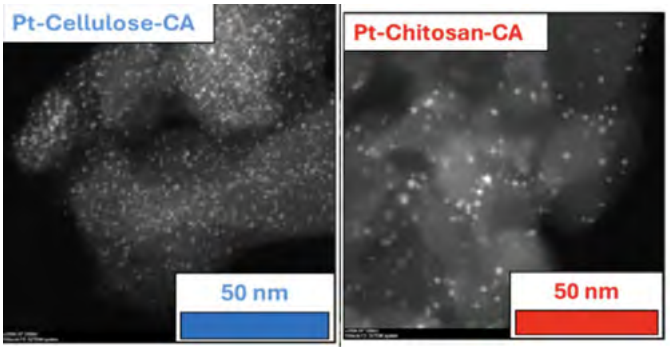


Figure 1: STEM images of Pt catalysts synthesized on cellulose- and chitosan-based carbon aerogel supports.

In addition, in the field of AEM electrolyzers, the ThinCoatAEM project supported by the CETP (Clean Energy Transition Partnership) is ongoing. This international project, consisting of partners Hydroyal (Sweden), Fraunhofer IKTS (Germany), Matteco (Spain), and KUHyTech, aims to achieve high performance and cost efficiency with lower catalyst loading by developing thin-coated electrode architectures for AEM electrolyzers. Within the project, single-cell performance analyses, long-term durability studies, and the design, assembly, and testing of a 1.5 kW short stack are carried out at KUHyTech under the leadership of Prof. Dr. Can Erkey.

In another collaboration with TU Hamburg, bio-based and novel carbon-supported electrocatalysts containing low amounts of Pt and Pt–Co alloys are being developed for the hydrogen evolution reaction (HER). Carbon aerogels with hierarchical pore structures enable homogeneous Pt nanoparticle distribution through a supercritical deposition method. Through structural design of the carbon supports and controlled nanoparticle formation, efficient utilization of Pt is achieved. The developed structures exhibit performance comparable to commercial Pt/C catalysts with 8–10 times lower Pt content and demonstrate higher long-term stability against support-related degradation mechanisms.

A new electrolyzer technology operating under supercritical conditions is also being developed at the center. Within the scope of the TÜBİTAK 2247-A National Leading Researchers Program, the project titled Development of a Supercritical Electrolyzer for Green Hydrogen Production, led by Prof. Dr. Can Erkey, aims to reduce performance losses by carrying out electrolysis in the supercritical phase of water and to increase system efficiency through the direct production of hydrogen at high pressure. This approach offers a different operating regime compared to existing electrolyzer technologies and is considered a potentially transformative technology in terms of efficiency and system integration.

Research activities are also conducted at the center in the field of CO_2 electrolysis. When powered by renewable electricity, CO_2 electrolysis provides an effective pathway for producing low-carbon fuels and chemicals for the chemical and energy sectors. In the project led by Dr. Pınar Göktürk under the TÜBİTAK 2247-B National Leading Researchers Program, the complex ionomer interfaces present in a specially designed zero-gap CO_2 electrolyzer cell are directly investigated under realistic and operando conditions. In this way, the project aims to clearly reveal how ionomer chemistry, electrolyte compo-

sition, and membrane properties shape the ionomer interface structure at the molecular level and how this affects the overall performance of CO_2 reduction.

2. Storage, Separation, and Transportation

The scalable realization of the hydrogen economy depends on safe storage, efficient separation, and reliable transportation solutions. In this context, KUHyTech conducts integrated research on materials development, system design, and modeling.

At the center, studies are carried out on hydrogen storage using solid and porous high-surface-area materials, as well as on separation and purification through selective membrane systems. These studies are of critical importance for industrial applications and the integration of energy systems.

In the field of storage and transportation, R&D activities are ongoing on the safety and performance of tank systems operating at pressure levels of 350 and 700 bar. Within a project conducted in collaboration with Aygaz, the temperature distribution inside tanks during filling is analyzed, and safe operation models are being developed to ensure that the temperature does not exceed 65°C under fast-filling conditions. These studies aim to strengthen the technical infrastructure for the safe and efficient use of hydrogen under real field conditions.

3. Utilization and System Integration

The widespread deployment of fuel cell systems based on the conversion of the chemical energy of hydrogen into electrical energy depends on the development of electrochemical structures with low precious group metal (PGM) content, high efficiency, and the ability to be reliably scaled at the fuel cell stack level. In this context, KUHyTech develops low precious metal loading and PGM-free electrocatalysts, as well as thin membrane structures with low gas crossover and high proton conductivity for Proton Exchange Membrane (PEM) fuel cell cells.

These developed components are integrated within membrane–electrode assembly (MEA) structures, where design and production processes are optimized, the microstructural integrity of the electrode layer is improved, and in-cell transport and kinetic performance are enhanced. The MEA structures are tested in single-cell configurations under different temperature, humidity, and pressure conditions through current–voltage and impedance analyses, and long-term stability and voltage degradation behavior are monitored under accelerated aging protocols.

Within this framework, KUHyTech focuses not only on the development of cells and components but also on scaling these structures to stack systems capable of operating at high power levels. Stack design is addressed together with balance-of-plant (BoP) systems, and gas supply, thermal management, and system architecture components are developed through a holistic engineering approach. Modeling and simulation studies are conducted to predict system performance under different operating scenarios, and the behavior of the developed fuel cell systems under real operating conditions is analyzed.

This approach aims to scale the developed electrochemical structures not only for low-power applications but also for applications requiring high power density and to implement them at the system level. Within the scope of collaborations with Ford Otosan and Otokar, studies are ongoing to develop and validate high-efficiency fuel cell structures with low PGM content suitable for high-power requirements.

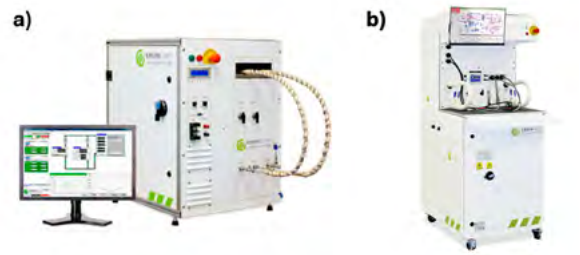


Figure 3: (a) Greenlight G40 PEM Fuel Cell Test Station and Greenlight E20 AEM Electrolyzer Test Station (b) Greenlight E40 PEM Electrolyzer Test Station.

Figure 2: PEM fuel cell development process: coating of the catalyst layer, preparation of the membrane–electrode assembly (MEA), and single-cell test configuration.

Infrastructure and Research Capacity of the Center

The new 600 m² laboratory area planned within KUHyTech includes infrastructure for membrane–electrode assembly (MEA) development, fuel cell and electrolyzer prototyping facilities, and advanced characterization capabilities. At the center, performance and durability tests are conducted at the single-cell and short-stack levels using the Greenlight G40 PEM Fuel Cell Test Station, Greenlight E40 PEM Electrolyzer Test Station, and Greenlight E20 AEM Electrolyzer Test Station. Through operando spectroscopy techniques (EC-XPS, EC-SERS, EC-FTIR, DEMS, EC-AFM), electrochemical processes can be analyzed under real operating conditions.

In addition, the Koç University Surface Technologies Research Center (KUYTAM) and the n²STAR Koç University Nanofabrication and Nanocaracterization Center for Scientific and Technological Advanced Research provide support for material characterization, surface coating, and device fabrication in the research activities.

The "Development of Clean Hydrogen Energy Technologies" Project Successfully Completed at Yıldız Technical University Hydrogen Research Center

Prof. Dr. İbrahim Dinçer

The Clean Hydrogen Energy Technologies Development Project, conducted under the Research University Support Program (ADEP) at Yıldız Technical University's Institute of Clean Energy Technologies and led by Prof. Dr. İbrahim Dinçer, was successfully completed in January after three years of intensive research and infrastructure development. The project aimed to establish an integrated research and application ecosystem focused on hydrogen, adopting a multidisciplinary approach covering the entire value chain from production to storage and end use.

Within the scope of the project, a Hydrogen Research Center was established at the university, infrastructure to manufacture the reactors and test cells was put into operation, and coating and electrode development stations for photoelectrochemical systems were developed. Thanks to these investments, prototype production and experimental validation processes can now be carried out quickly within the institution.

The project has yielded significant gains not only in technological development but also in terms of human resources and academic output. One of the project's strongest outcomes has been the creation of a multidisciplinary research and education environment that brings together different disciplines under one roof. The work is carried out through the collaboration of different disciplines such as mechanical, chemical, electrical-electronic, materials, and environmental engineering. The nature of topics such as hydrogen production, storage, fuel cells, and system integration requires an interdisciplinary approach, which has enhanced both the scientific depth and practical applicability of the solutions developed within the scope of the project.

In this context, numerous master's and doctoral students have been actively integrated into the project. Students have received training in various areas of expertise, including experimental laboratory work, modeling, simulation, life cycle assessment, and system optimization. Currently, one master's student has successfully completed their studies, and 9 master's and 6 doctoral students continue to be actively collaborating in the project. Thanks to the developed infrastructure and research capacity, the center is always open to new graduate students and young researchers interested in interdisciplinary work. Students wishing to work in the field of hydrogen and clean energy are constantly encouraged to join the team, and new researchers are regularly accepted.

This multidisciplinary approach yielded 15 international publications in the Q1 category within the scope of the project, numerous national and international project applications have been made, and some of them have been awarded funding. At the same time, meetings, trainings, and seminar-based collaborations have been established with the public and private sectors. These results have ensured the creation of a sustainable research capacity in hydrogen technologies and strengthened university-industry interaction.

Signatures Signed for Hydrogen-Powered Train Project Between Türkiye and the United Kingdom

Türkiye and the United Kingdom have taken an important step toward the development of hydrogen-powered train technologies. Within the framework of the Hydrogen-Powered Train Development Project, a cooperation protocol was signed between Türkiye Rail System Vehicles Industry Inc. (TÜRASAŞ) and the United Kingdom under the coordination of the Ministry of Transport and Infrastructure.

The protocol was signed by Selim Koçbay, General Manager of TÜRASAŞ, and Jill Morris, the United Kingdom's Ambassador to Ankara.

Minister of Transport and Infrastructure Abdulkadir Uraloğlu stated that the collaboration represents a significant milestone not only for the railway sector but also for advancing environmentally friendly and sustainable transportation solutions.

The project aims to develop hydrogen fuel cell-powered train technologies. As part of the collaboration, prestigious academic institutions and expert organizations from the United Kingdom will provide technical contributions to the project. On the Turkish side, TÜRASAŞ will play a central role as the prototype production center.

Within the project framework, technical work will be carried out in cooperation with relevant stakeholders in areas such as fuel cell technologies and system integration. The hydrogen-powered locomotives are planned to be manufactured at the TÜRASAŞ Eskişehir Regional Directorate.

Minister Uraloğlu emphasized that the project is primarily an R&D initiative, noting that all intellectual property rights of the developed technologies will belong to TÜRASAŞ.

Building Sustainable Capacity in Hydrogen Technologies

The project is expected to strengthen Türkiye's institutional capacity in the field of hydrogen-powered railway vehicles. The cooperation will include knowledge transfer and technical support in key technical areas such as system design, architecture, power electronics, energy management, and safety.

Uraloğlu highlighted that Türkiye's domestic engineering capabilities will be further enhanced through the project and stated:

"Our goal is to build sustainable capacity in hydrogen technologies and develop competitive domestic solutions that meet international standards. Through these efforts, we aim to position TÜRASAŞ as a regional center in this field."

Hydrogen fuel cell trains significantly reduce carbon emissions while also lowering noise pollution, providing a more comfortable and environmentally friendly transportation experience.

The project is considered an important step toward green transportation systems and is viewed as a key component of investments aligned with Türkiye's Century of Türkiye vision for sustainable mobility and clean energy technologies.

Source: https://www.aa.com.tr/tr/ekonomi/hidrojen-yakitli-tren-icin-turkiye-ve-ingiltere-arasinda-imzalar-atildi/3807593

ITU Forms the Türkiye Team for the LEAP-SE Supported BioHyPEM Project

The ITU team will develop bio-based membranes for PEM fuel cells and green hydrogen electrolyzers within an international consortium. Researchers from Istanbul Technical University (ITU) will participate in the BioHyPEM project, which has been selected for funding under the LEAP-SE (Long-Term Joint EU–AU Research and Innovation Partnership on Sustainable Energy) program aimed at strengthening research and innovation cooperation between Europe and Africa in the field of sustainable energy. With a total budget of €1 million, the project titled "BioHyPEM – High-Performance Bio-Based Membranes and Catalysts for PEM Fuel Cells and Green Hydrogen Electrolyzers" focuses on the development of innovative bio-based membranes and catalysts for proton exchange membrane (PEM) fuel cells and green hydrogen electrolyzers. Within the project, chitosan, a renewable polysaccharide, will be chemically modified with poly(-vinyl alcohol) (OPVA) to produce proton exchange membranes (PEM). The performance of these newly developed membranes will be validated by the ITU research team at Technology Readiness Level (TRL) 5 through PEM fuel cell and electrolyzer stack demonstrations.

The BioHyPEM project brings together leading research institutions from Europe and Africa. The project is coordinated by CRTEn – Energy Research and Technology Center (Tunisia).

Project partners include:

- CRTEn – Energy Research and Technology Center (Tunisia) – Coordinator
- EPRI – Egyptian Petroleum Research Institute (Egypt)
- CNRS / Université Paris Cité – UMR 7086 (France)
- CNRS / Université Paris-Est Créteil – UMR 7182 (France)
- UTT – University of Technology of Troyes (France)
- CNR-ITAE – Institute of Advanced Energy Technologies (Italy)
- NOVA FCT – NOVA School of Science and Technology (Portugal)
- Chitelix (Tunisia)
- BECOME Institute (France)

The Turkish team of the project consists of three researchers from Istanbul Technical University:

- Assoc. Prof. M. Suha Yazıcı – ITU Energy Institute (Principal Investigator)
- Prof. Alper Sarıoğlan – ITU Department of Chemical Engineering
- Assoc. Prof. Aytekin Uzunoğlu – ITU Department of Metallurgical and Materials Engineering

The BioHyPEM project is expected to contribute significantly to the development of sustainable and high-performance bio-based membranes and support the advancement of the green hydrogen economy and clean energy technologies.

Sources: ITU Media and Communications Office

NEW CORPORETIVE MEMBER

ABOUT OBA PERDESAN

OBA has been specializing in technical textile coating technologies since 1972. The company's main product line consists of developing surface coatings to add various properties to technical textiles, as well as producing interior curtain systems made with polymer and aluminum extrusion lines. It operates 4 industrial blade coating machines and 13 extrusion lines. OBA also actively conducts laboratory-scale coating processes in its own R&D laboratory.

Since 2018, OBA has successfully completed various projects in different fields as a result of increased R&D and innovation activities. In 2024, it expanded its work into clean energy systems through a nationally supported TÜBİTAK project for fuel cell component development. Supported by the Ministry and TÜBİTAK, OBA is currently running a fuel cell component development project. The company continues to reduce its carbon footprint and supports decarbonization efforts through other ongoing projects.

Although OBA's core sector is textiles, it aims to enter the energy sector in response to evolving demands and research trends. We aim to successfully commercialize the fuel cell component project and establish a presence in the market. OBA also strives to take an active role in sustainability initiatives and in the field of hydrogen, the energy of the future.

BOOKS OF THE MONTH

Comprehensive Energy Systems

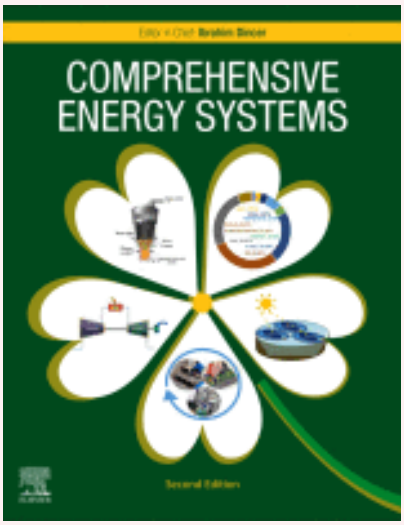
A Comprehensive Resource in Energy Science and Technologies

Published by Elsevier, one of the world's leading scientific publishers, Comprehensive Energy Systems (Second Edition, 2025) has been released as a significant contribution to the energy literature. The work is edited by the President of the Association, Prof. Dr. Ibrahim Dincer.

Dr. Yusuf Bicer, Dr. Canan Acar, Dr. Can Ozgur Colpan, Dr. Nader Javani, and Dr. Tahir Abdul Hussain Ratlamwala served as chapter editors.

The book provides a unified and holistic source of information covering the entire spectrum of energy, one of the most critical issues facing humanity. The way we approach energy has direct implications for the economy, the environment, and sustainability. For this reason, energy systems play a vital role in our society. Energy systems are defined as the set of sources and technologies required for energy extraction, transportation, distribution, conversion, and utilization. This comprehensive work explains both traditional and novel energy systems, from single-generation to multi-generation systems, addressing theory alongside practical applications. It also covers energy policies, strategies, environmental impacts, and sustainable development. No other published work addresses such a broad range of topics with comparable depth.

Organized under the main headings of Energy Fundamentals, Energy Materials, Energy Production, Energy Conversion, and Energy Management, this ten-volume set adopts a holistic approach to energy production, conversion, storage, and utilization processes, evaluating their technical, economic, and environmental dimensions together. The volumes encompass a wide range of topics including energy fundamentals, energy materials, energy production and conversion technologies, energy management, sustainability, and policy and strategy development.



In addition, contemporary topics such as artificial intelligence applications, energy trading, transport and transmission systems, energy consumption dynamics, and recent global developments are also included. In this respect, Comprehensive Energy Systems serves as a reference source for academics, engineers, policymakers, and industry professionals.

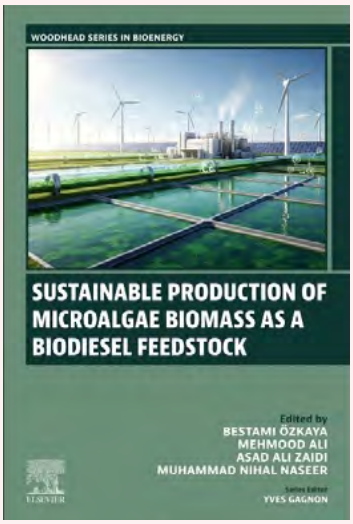
Microalgae Biomass and Its Contribution to Sustainable Energy:

Sustainable Production of Microalgae Biomass as a Biodiesel Feedstock Published in 2026 Under the Editorship of Prof. Dr. Bestami Özkaya.

The book titled *Sustainable Production of Microalgae Biomass as a Biodiesel Feedstock*, edited by Prof. Dr. Bestami Özkaya, Member of the Board of Directors of the Hydrogen Technologies Association and Vice Rector of Istinye University, was published in 2026. The volume addresses the sustainable production of microalgae biomass, its technical and economic potential as a biodiesel feedstock, and its integration with carbon capture, circular economy frameworks, and renewable energy systems from both scientific and application-oriented perspectives.

Sustainable Production of Microalgae Biomass as a Biodiesel Feedstock brings together the latest methods in the production and utilization of microalgae for biodiesel, offering new insights into how this process can be environmentally friendly, renewable-integrated, energy-efficient, and supportive of climate change mitigation. The book begins by introducing various feedstock options for biodiesel production and their selection criteria, the different biodiesel production processes, and the role of microalgae-based biodiesel as an alternative fuel for diesel engines. Strategies for reducing energy consumption during production, as well as the connections between microalgae cultivation and CO_2 capture, are also examined.

Subsequent sections focus on renewable energy integration supported by specific case studies. This is followed by a section addressing sustainability and related impacts, including techno-economic analyses comparing conventional and renewable energy sources, as well as life cycle assessment. Finally, emerging technologies and future research opportunities are discussed. As a new volume in the Woodhead Series in Bioenergy, this book represents a valuable resource for graduate students, researchers, faculty members, engineers, R&D professionals, industry stakeholders, and policy makers interested in biodiesel production from microalgae, bioenergy, biotechnology, and clean energy.



REPORTS:

Please scan the QR code to access the reports.

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