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Boletim de Vigilância Tecnológica

Número 8
Julho 2025

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Boletim de Vigilância Tecnológica

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NOTÍCIAS

Produção de Hidrogénio

1 Adding one ingredient to water can boost per-kWh hydrogen output by more than 25% in PEM electrolysers, scientists find

10/07/2025 | Hydrogen Insight| **Link**

Researchers have discovered that adding a common polymer — polyethylene oxide (PEO) — to water used in PEM (Proton Exchange Membrane) electrolysis can increase hydrogen output by more than 25% per kilowatt-hour. This breakthrough enhances the performance of electrolyser systems without changing their core design. The polymer improves the structure of water and facilitates better ion transport across the membrane, leading to significantly higher hydrogen production efficiency. This innovation could contribute to reducing the cost of green hydrogen and accelerating the adoption of electrolysis technologies in the energy transition.

2 South Korea announces 2025 hydrogen power generation tenders with new improved terms

01/07/2025 | H2 View | **Link**

H2Brazil plans to invest €1.3 billion in a large-scale green hydrogen and ammonia production project in Uberaba, Brazil. The facility will produce 125,000 tonnes of hydrogen and 700,000 tonnes of ammonia per year, using alkaline electrolysis to meet market demand more rapidly. Operations are expected to begin in 2027, with a targeted hydrogen cost of €2.50/kg. This project positions Brazil as a key emerging player in the global green hydrogen landscape.

3 Thyssenkrupp Nucera acquires alkaline tech from soon-bankrupt Green Hydrogen Systems

20/06/2025 | H2 View| **Link**

thyssenkrupp nucera has signed an agreement to acquire key assets from the near-bankrupt Danish company Green Hydrogen Systems, including high-pressure alkaline water electrolysis (AWE) technology. The deal aims to enhance thyssenkrupp's hydrogen production capabilities by integrating systems capable of operating at pressures up to 35 bar. This acquisition is expected to improve system efficiency and reduce compression needs. Finalisation is planned by late summer 2025, pending regulatory and judicial approvals.

4 Repsol cancels its green hydrogen plant in Puertollano due to its economic inability to operate

09/07/2025 | Hydrogen Central| **Link**

Repsol has officially canceled its green hydrogen production project in Puertollano, Spain, citing the economic impossibility of operating the plant under current conditions. The project, which involved a 100 MW electrolyzer, aimed to produce green hydrogen using renewable electricity. However, high electricity costs, regulatory uncertainty, and the lack of sufficient financial incentives rendered the operation unfeasible. This decision reflects broader concerns in the industry about the commercial viability of large-scale green hydrogen projects in the absence of strong policy support and favorable market conditions.

5 Toyota Kirloskar Motor and Ohmium Collaborate on Potential Opportunities to Develop Green Hydrogen Solutions in India

27/06/2025 | Hydrogen Central| **Link**

Toyota Kirloskar Motor (TKM) and Ohmium International have signed a Memorandum of Understanding to explore scalable green hydrogen solutions in India. The collaboration focuses on on-site hydrogen production through Proton Exchange Membrane (PEM) electrolysis powered by renewable energy sources. The hydrogen will be used primarily in microgrid applications to support decarbonization in sectors such as data centers and industrial facilities. This initiative highlights the role of localized hydrogen generation in supporting India's energy transition and advancing sustainable, clean energy ecosystems.

6 Portugal allocates €70 million to 17 hydrogen and renewable gas projects

08/07/2025 | Hydrogen Europe | **Link**

In July 2025, the Portuguese government announced the allocation of €70 million to support 17 projects focused on the production of hydrogen and renewable gases. This funding aims to strengthen national capabilities in clean energy generation, in line with the country's decarbonisation goals and the European Union's green transition agenda. The selected projects are expected to enhance the domestic production of renewable hydrogen through technologies such as electrolysis, contributing to a more resilient and sustainable energy system. This initiative is part of a broader strategy to promote energy independence, reduce greenhouse gas emissions, and stimulate industrial innovation.

NOTÍCIAS

Produção de Hidrogénio

7 Tecnología para transformar aguas residuales en catalizadores de hidrógeno verde

22/07/2025 | Hidrogeno Verde| **Link**

Un equipo de investigadores ha logrado transformar metales presentes en aguas residuales —como níquel, cromo o platino— en catalizadores eficientes para la electrólisis del agua. Este enfoque elimina la necesidad de agua purificada y reduce significativamente los costes de producción del hidrógeno verde. Además de ser una solución tecnológica innovadora, el método contribuye a la economía circular al reutilizar contaminantes como recurso útil. Esta estrategia representa un avance clave hacia una producción de hidrógeno más accesible, limpia y sostenible.

8 Siemens and Paragon to scale ultra-clean hydrogen production

31/07/2025 | Hydrogen Central| **Link**

Siemens has partnered with Paragon Resources to scale up the production of ultra-clean hydrogen using a novel process that requires no fossil fuels or external electricity. Paragon's method reacts treated, recycled aluminum with water and a catalyst to produce hydrogen, heat, and aluminum hydroxide with minimal environmental impact. Siemens will provide expertise in automation, digital control, and AI to help move the technology from pilot phase to industrial-scale deployment. This collaboration aims to support hard-to-abate industries while promoting sustainability, energy efficiency, and circular economy practices.

9 Chinese electrolyser maker Envision signed up as strategic partner for 500MW green hydrogen/ammonia project in Brazil

31/07/2025 | Hydrogen Insight| **Link**

Chinese electrolyser manufacturer Envision Energy has been chosen as the strategic partner for a 500MW green hydrogen and ammonia project in northeast Brazil, led by Spanish developer FRV. The H2 Cumbuco project at Pecém Port selected Envision for its expertise in integrated renewable energy systems, powered by AI. This decision is seen as a setback for European electrolyser manufacturers, who fear that lower-cost Chinese equipment could dominate the hydrogen market, much like what happened in the solar industry during the 2010s

NOTÍCIAS

Células de Combustível

1 Hope Gas and WATT Fuel Cell Launch Innovative WATT HOME™ Solid Oxide Fuel Cell Backup Power Leasing Program to Strengthen Grid Resiliency Across West Virginia

25/06/2025 | Hydrogen Central | **Link**

Hope Gas and WATT Fuel Cell have announced the rollout of 7,250 WATT HOME™ solid oxide fuel cell (SOFC) systems by 2028 across West Virginia. These units provide continuous, low-emission backup power using natural gas, aiming to strengthen grid resilience in rural communities. The program introduces a leasing model for residential use, representing a step forward in the adoption of distributed fuel cell technology.

2 Honda Changes Plan to Build New Production Plant for Next-generation Fuel Cell Module in Japan

03/07/2025 | Hydrogen Central | **Link**

HONDA

Honda has revised its original plan to build a large-scale production plant for next-generation fuel cell modules in Moka, Japan. Initially set to start operations by the end of fiscal year 2028 with a production capacity of 30,000 units per year, the company has now decided to scale down and postpone the project. This adjustment comes after reevaluating global hydrogen market trends. As a result, Honda no longer meets the eligibility criteria for public subsidies under Japan's Green Transformation (GX) subsidy program, which requires a minimum production capacity. The company remains committed to advancing fuel cell technology but will adjust its approach based on market readiness and demand.

3 Passenger Ship HANARIA Equipped with Yanmar's Maritime Hydrogen Fuel Cell System Wins Marine Engineering of the Year 2024

24/07/2025 | Hydrogen Central | **Link**

The HANARIA, Japan's first hybrid passenger ship powered by hydrogen and biodiesel, has won the Marine Engineering of the Year 2024 award. Equipped with Yanmar's GH240FC hydrogen fuel cell system and a proprietary battery and power management system, the vessel can operate in both zero-emission and hybrid modes. Operated by MOL Techno-Trade, the ship was also named Ship of the Year 2024, becoming the first vessel to earn both honors. Its design reduces environmental impact while improving comfort by lowering noise and emissions. The project highlights Yanmar's push for maritime decarbonization through its GREEN CHALLENGE 2050.

4 Stellantis Discontinues Hydrogen Fuel Cell Technology Development Program

18/07/2025 | Hydrogen Central | **Link**

Stellantis has announced it will discontinue its hydrogen fuel cell development program due to poor mid-term market prospects and infrastructure challenges. Production of its hydrogen-powered Pro One vans in France and Poland will stop, and the planned launch for 2025 has been canceled. The company cited high investment costs, limited refueling networks, and weak consumer demand. R&D efforts will be redirected to other projects, and Stellantis is in talks with Symbio partners about the decision's impact. This move aligns with Stellantis' shift toward electric and hybrid vehicles to meet EU emissions goals.

5 Heven Demonstrates Fuel Cell UAV Flight at 12,000 ft

18/07/2025 | Hydrogen Central | **Link**

Heven's Zepher Flight Labs successfully flew its hydrogen-powered Z1 UAV to 12,000 feet, marking a major milestone in fuel cell drone performance. The Z1, a vertical takeoff and landing (VTOL) aircraft, carried full weight and maintained system integrity throughout the climb. Designed for endurance and versatility, it offers over 10 hours of flight time and supports multiple mission types. The flight is part of an ongoing test program aiming for a 20,000-foot ceiling, in coordination with Army Research Labs. This achievement strengthens Heven's U.S. expansion and highlights the growing role of hydrogen drones in defense and logistics.

6 Doosan Fuel Cell begins mass production of systems using Ceres solid oxide technology

28/07/2025 | Hydrogen Tech World | **Link**

UK-based Ceres Power has reached a major milestone as its partner Doosan Fuel Cell becomes the first to begin commercial-scale manufacturing of products using Ceres' metal-supported solid oxide fuel cell (SOFC) technology. Aimed initially at the South Korean market, the SOFC systems will serve applications such as data centers, grid stabilization, microgrids, building power, and marine auxiliary power. Doosan's facility, the first globally dedicated to Ceres' technology, is set to start sales before the end of 2025. Both companies see this as a key step toward global energy resilience and decarbonization.

NOTÍCIAS

Tecnologia de Armazenamento de Hidrogénio

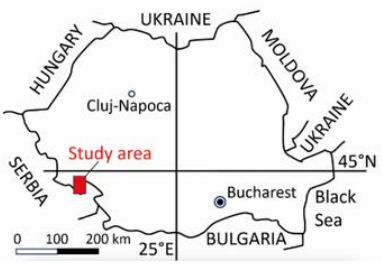
1 Boil-off losses are a 'threat' to hydrogen refuelling's commercial case: Taylor Wharton

25/06/2025 | H2 View | **Link**

Taylor-Wharton has raised concerns about significant boil-off losses in cryogenic hydrogen tanks, which can reach between 10% and 50%. These losses result from pressure buildup due to hydrogen evaporation during storage, particularly during low-demand periods. Mitigating such losses requires advanced insulation technologies and pressure control systems, which directly affect the efficiency and economic viability of hydrogen storage at refuelling stations.

2 First Direct Evidence of a Natural Hydrogen Reservoir Found in Romania's Ophiolite Rocks

03/06/2025 | Hydrogen Central | **Link**



In July 2025, researchers reported the first direct evidence of a pressurized natural hydrogen reservoir located in ophiolitic rocks in Romania. This breakthrough confirms that ultramafic geological formations can trap and preserve hydrogen over long periods. The discovery, made at depths of around 1,000 meters, suggests a promising avenue for natural underground hydrogen storage and potentially even "white" hydrogen production, offering a sustainable and low-emission alternative to conventional hydrogen generation methods. This finding significantly advances the field of geological hydrogen exploration and may influence future strategies for hydrogen resource development

3 Exolum successfully demonstrates how aviation and road fuel infrastructure can meet hydrogen storage challenge

24/07/2025 | Hydrogen Central |**Link**

Exolum has successfully demonstrated that existing road and aviation fuel infrastructure can be adapted for large-scale hydrogen storage using liquid organic hydrogen carriers (LOHC). In a UK-based pilot, 400 million litres of LOHC were safely transported through pipelines, proving the method to be cost-effective and practical without major modifications. This approach could store up to 1 TWh of hydrogen at a single site, covering a third of the UK's 2030 storage needs. Compared to geological options, LOHC offers greater flexibility and lower capital costs. The project supports hydrogen's role in decarbonization strategies in the UK and Spain

4 New liquid can simplify hydrogen transportation and storage

18/07/2025 | Hydrogen Central | **Link**

Researchers from EPFL and Kyoto University have developed the first hydride-based deep eutectic solvent (DES), a stable hydrogen-rich liquid that remains liquid at room temperature. Made from ammonia borane and tetrabutylammonium borohydride, the mixture contains up to 6.9% hydrogen by weight and releases hydrogen at just 60°C—making storage and transport much easier and safer than with traditional methods. The liquid remains stable for weeks and does not crystallize, even at –50°C. This breakthrough could replace high-pressure or cryogenic storage systems and significantly advance practical hydrogen applications.

5 New Flyer reveals extended-range hydrogen bus with four-tank upgrade

17/07/2025 | H2 View | **Link**

New Flyer subsidiary NFI Group has unveiled its new 40-foot hydrogen fuel cell-powered bus under the company's Xcelsior Charge FC portfolio.
Featuring recyclable high-power batteries and up to 90% energy recovery through regenerative braking, the vehicle also has a new optional hydrogen four-tank module that adds 17.5kg of onboard hydrogen storage.
By increasing total tank count from five to nine, the additional storage reportedly adds up to 120 miles of range.

6 NASA tests innovative technique for super cold fuel storage

29/07/2025 | Hydrogen Europe| **Link**

In the harsh environment of space, keeping cryogenic propellants like liquid hydrogen and oxygen cold is challenging due to heat from spacecraft systems, solar radiation, and exhaust. These super-cold fluids have extremely low boiling points and are prone to boiloff, even in space's frigid vacuum. NASA's Marshall Space Flight Center is testing a groundbreaking cryogenic fluid management system that uses two stages of active cooling to achieve zero boiloff of liquid hydrogen. This technology is crucial for long-duration missions to the Moon, Mars, and beyond, ensuring fuel preservation and mission success.

NOTÍCIAS

Distribuição de Hidrogénio

1 Chinese hydrogen refuelling station giant signs deal to enter Spanish, Portuguese and Latin American markets

18/07/2025 | Hydrogen Insight | **Link**

Chinese hydrogen refuelling giant Houpu Clean Energy has signed a partnership with BrightHy Solutions, a subsidiary of Fusion Fuel, to expand into Spain, Portugal, and Latin America. BrightHy will represent Houpu's hydrogen refuelling equipment and technologies in these markets. The goal is to accelerate the rollout of hydrogen infrastructure for mobility, supporting decarbonization in the transport sector and marking Houpu's first major step into international markets.

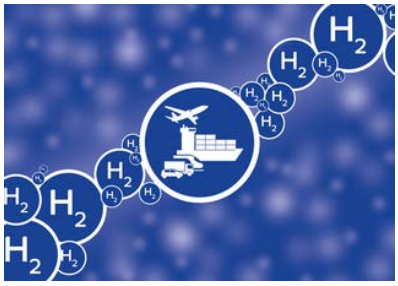
2 Cleveland-Cliffs to abandon massive US green steel plans due to lack of clean hydrogen: report

04/06/2025 | Hydrogen Insight | **Link**

Cleveland-Cliffs has scrapped its green steel project in Ohio, citing the unavailability of clean hydrogen as the key reason. The plan involved replacing coal-based blast furnaces with hydrogen-based DRI technology. However, the lack of local infrastructure to supply low-carbon hydrogen made the project unviable. This situation highlights a major barrier to industrial decarbonization: without reliable hydrogen distribution networks, even advanced low-emission technologies cannot move forward.

3 HysetCo inaugurates high-capacity hydrogen station at Orly Airport

04/07/2025 | Hydrogen Central | **Link**



HysetCo has officially opened a new high-capacity hydrogen refueling station at Paris Orly Airport. This station is capable of dispensing up to 1 ton of hydrogen per day and is designed to support intensive fleet operations, including taxis and light commercial vehicles. The project is a significant step in expanding France's hydrogen refueling infrastructure, aiming to accelerate the transition to zero-emission mobility. The station will contribute to decarbonizing transport in the Île-de-France region and is part of broader efforts to establish a sustainable hydrogen ecosystem around major transport hubs.

4 Klaipėda Port to launch Baltic region's first green hydrogen facility

18/07/2025 | Hydrogen Europe | **Link**

The Port of Klaipėda in Lithuania is set to become the first in the Baltic region to implement a comprehensive green hydrogen infrastructure. The project includes a 2.25 MW PEM electrolyser capable of producing approximately 127 tonnes of hydrogen annually. This hydrogen will be distributed via an internal network to power ships, port equipment, heavy-duty trucks, buses, and private vehicles. The initiative is part of a broader effort to decarbonize the port's operations and contribute to Lithuania's national and EU climate goals. The project is supported by local and EU funding and aligns with the European Green Deal and Fit for 55 package.

5 DB Cargo unveils high-pressure hydrogen container for rail transport

12/06/2025 | Hydrogen Tech World | **Link**

DB Cargo, in collaboration with Hexagon Purus and other partners, has introduced a new high-pressure container for the rail transport of hydrogen. The MEGC (Multiple Element Gas Container) can store hydrogen gas at 500 bar with a total capacity of 1,223 kg. This innovation aims to enhance hydrogen logistics by shifting part of the distribution from road to rail, improving efficiency, reducing emissions, and supporting the development of a multimodal hydrogen transport infrastructure. The project is supported by the German Federal Ministry for Digital and Transport (BMDV).

6 Scale Green Energy desplegará una red de estaciones de repostaje de hidrógeno en España

17/06/2025 | Hidrogéno Verde | **Link**

La empresa Scale Gas, filial de Enagás Renovable, ha recibido más de 8 millones de euros de financiación europea a través del programa CEF (Connecting Europe Facility) para instalar seis estaciones de repostaje de hidrógeno verde en los corredores Atlántico y Mediterráneo de la red transeuropea de transporte (TEN-T). Estas infraestructuras estarán ubicadas en puntos estratégicos para apoyar el despliegue de la movilidad basada en hidrógeno, especialmente para el transporte pesado. El proyecto refuerza el papel de España en la transición energética y en la consolidación de un sistema de distribución de hidrógeno a nivel europeo.

NOTÍCIAS

Mobilidade Terrestre com Hidrogénio

1 Hyundai Launches Hydrogen-Powered Refuse and Hook-Lift Trucks for Zero-Emission Waste Collection

04/07/2025 | Hydrogen Central | **Link**

Hyundai has launched new hydrogen-powered refuse and hook-lift trucks based on its XCIENT Fuel Cell platform. These heavy-duty vehicles are designed to support zero-emission municipal operations. They offer a driving range of approximately 400 km, fast refueling in about 15 minutes, payload capacity comparable to diesel trucks, and the ability to operate continuously throughout the day. This initiative marks a significant step forward in applying hydrogen technology to heavy transport and decarbonizing public services.

2 Hydrogen cars now beat EVs with lowest life-cycle emissions of all, says ICCT

15/07/2025 | Hydrogen Europe | **Link**

A new analysis by the International Council on Clean Transportation (ICCT) reveals that hydrogen-powered vehicles (FCEVs) can now achieve the lowest life-cycle greenhouse gas emissions of all vehicle types, including battery electric vehicles (BEVs), when powered by green hydrogen. The study underscores the critical importance of hydrogen sourcing: if produced from fossil fuels, hydrogen drastically increases emissions, surpassing even diesel. The findings emphasize the environmental potential of FCEVs and the need for policy alignment with renewable hydrogen production.

3 Students from MIT have created a 300bhp hydrogen fuel cell motorcycle

09/07/2025 | Hydrogen Central | **Link**

A team of students from the Massachusetts Institute of Technology (MIT) has unveiled a prototype hydrogen-powered motorcycle capable of delivering 300 brake horsepower (bhp). The vehicle uses a hydrogen fuel cell to generate electricity, which powers an electric drivetrain, offering high performance with zero emissions. The project showcases the potential of hydrogen fuel cell technology in two-wheeled mobility, pushing the boundaries of sustainable high-speed transport. This innovation highlights a growing interest in alternative, clean propulsion systems within the mobility sector.

4 H2 Mobility, HOYER Group sign supply contract for hydrogen in Germany

24/07/2025 | Hydrogen Central | **Link**

H2 MOBILITY, a leading operator of hydrogen refueling stations in Germany, has signed a supply contract with the HOYER Group to manage hydrogen logistics in the Rhein-Neckar region. HOYER will handle transport, quantity tracking, and delivery planning, supporting the development of hydrogen infrastructure. This partnership strengthens HOYER's role in the hydrogen market, aligning with its "New Energies" strategy. Both companies aim to improve supply reliability and flexibility for hydrogen mobility. The deal contributes to Germany's broader transition toward sustainable energy.

5 One of the five large buses sold in Korea this year is hydrogen powered

24/07/2025 | Hydrogen Central | **Link**

Nearly 20% of large buses sold in South Korea in early 2025 were hydrogen-powered, marking a sharp rise from previous years. Hyundai Motor is shifting focus to hydrogen for commercial vehicles, as hydrogen fuel cells offer longer range, faster refueling, and better efficiency for heavy transport. In the first five months, 380 out of 1,923 large buses sold were FCEVs. Experts note hydrogen is more viable for large vehicles than passenger cars. Hyundai is also partnering with major transport operators to expand hydrogen bus adoption.

6 Transport for Wales plans hydrogen bus trial in Swansea

30/07/2025 | H2 View | **Link**

Transport for Wales (TfW) has announced plans to deploy hydrogen-powered buses in Swansea as part of the Welsh transport strategy, Llwybr Newydd.
According to reports, the city will trial hydrogen-powered public transport operations and explore the development of a hydrogen refuelling hub on Fabian Way.
H2 View understands that Swansea Council expect the buses to be operational from 2027.

7 CaetanoBus reforça oferta de autocarros urbanos de zero emissões

12/06/2025 | Observador | **Link**

A CaetanoBus lançou uma nova gama de autocarros de zero emissões, com versões elétricas e a hidrogénio. Com design moderno e construção modular, estão disponíveis em três tamanhos. As baterias são de longa duração e as versões a hidrogénio usam tecnologia da Toyota. A empresa destaca o avanço na mobilidade elétrica.

8 ITJ y CIUDEN presentan el motor de combustión interna de hidrógeno verde del proyecto Hycerail

17/06/2025 | MITECO | **Link**

El Instituto para la Transición Justa (ITJ) y la Fundación Ciudad de la Energía (CIUDEN), ambas entidades dependientes del Ministerio para la Transición Ecológica y el Reto Demográfico (MITECO), han presentado este martes el motor de combustión interna de hidrógeno verde del proyecto Hycerail, impulsado desde el ministerio con ayudas por valor de 2,5 millones de euros. El proyecto, en cuya presentación han participado hoy la directora del ITJ, Judit Carreras, y la directora general de CIUDEN, Yasodhara López, busca demostrar la viabilidad de la descarbonización del transporte ferroviario mediante el empleo del hidrógeno verde como combustible.

NOTÍCIAS

Corredores de Hidrogénio: Aspetos Normativos e de Promoção

1 El MITECO asigna 524 millones a cinco proyectos de clústeres y tecnologías industriales de hidrógeno renovable del IPCEI Hy2Use

04/06/2025 | MITECO | **Link**

Sumarán una potencia adicional de electrólisis de 425 MW alimentada con energía solar, eólica e hidráulica, con una producción anual prevista de 55.200 toneladas de hidrógeno verde

Se trata de cuatro grandes proyectos de producción de hidrógeno y una industria innovadora, seleccionados por la Comisión Europea en Andalucía, Aragón, Asturias, País Vasco y Región de Murcia

Estos proyectos permitirán avanzar en una economía del hidrógeno renovable sólida, acelerando el proceso de descarbonización y ganar competitividad industrial en el despliegue de las energías renovables

2 CEF Transport: over €1 billion requested for alternative fuel supply infrastructure

12/06/2025 | CINEA | **Link**

95 project proposals requesting more than €1 billion in co-funding have been submitted to the CEF Transport Alternative Fuels Infrastructure Facility (AFIF) by the second cut-off deadline of 11 June 2025.

CINEA will now check the admissibility and eligibility of the proposals which will then be evaluated against the specific award criteria of the call. The entire evaluation process is expected to be concluded by early 2026 when the results will be announced at the latest.

The call covers the roll-out of alternative fuels supply infrastructure for road, maritime, inland waterway and air transport. It supports recharging stations, hydrogen refuelling stations, electricity supply and ammonia and methanol bunkering facilities.

3 El MITECO adjudica 1.223 millones a siete proyectos de hidrógeno verde

13/06/2025 | MITECO | **Link**

Los siete beneficiarios del programa H2 Valles se ubicarán en Aragón, Andalucía, Castilla y León, Cataluña y Galicia

Estos nuevos desarrollos sumarán 2.292,8 MW de potencia de electrólisis en 12 instalaciones y movilizarán inversiones cercanas a los 6.000 millones

Los clústeres o valles son esenciales para la producción y uso de hidrógeno verde en grandes polos industriales e integrar todas las etapas de la cadena de valor en enclaves agrupados

NOTÍCIAS

Corredores de Hidrogénio: Aspetos Normativos e de Promoção

4 New green hydrogen subsidies and auction rounds on the table in UK 'action plan'

24/06/2025 | Hydrogen Insight | **Link**

The UK government has unveiled a new action plan aimed at accelerating the deployment of green hydrogen. The plan includes fresh rounds of public subsidies and auctions to support the development of hydrogen production, pipelines, storage, and hydrogen-fired power stations. These measures are designed to provide greater investment certainty and promote long-term decarbonisation goals across the hydrogen value chain.

5 New EU Energy and Raw Materials Platform to support the competitiveness and decarbonisation of European industry

02/07/2025 | European Commission | **Link**

In a strategic move to strengthen the competitiveness of Europe's industry and leverage the Union market towards more security of supply, diversification and decarbonisation, the Commission today launched the Hydrogen Mechanism under the EU Energy and Raw Materials Platform. The online platform will host different mechanisms covering hydrogen, raw materials, natural gas and biomethane, with the possibility to cover other products in the future. It aims to empower European companies to efficiently source energy and raw materials.
Today's launch marks the entry into operation of the first mechanism under the platform, the Hydrogen Mechanism, designed to support the market development of renewable and low-carbon hydrogen and its derivatives (ammonia, methanol, electro-sustainable aviation fuel 'eSAF').

6 Commission strengthens Europe's chemical industry

08/07/2025 |European Commission| **Link**

European Commission

Today, the European Commission presented an Action Plan for the Chemicals Industry to strengthen the competitiveness and modernisation of the EU chemical sector. The Action Plan addresses key challenges, namely high energy costs, unfair global competition, and weak demand, while promoting investment in innovation and sustainability. The Action Plan is accompanied by a simplification omnibus on chemicals – the sixth that the Commission has presented in this mandate so far – to further streamline and simplify key EU chemicals legislation, alongside a proposal to strengthen the governance and financial sustainability of the European Chemicals Agency (ECHA).

NOTÍCIAS

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7 Clarity to hydrogen sector with new EU methodology for low-carbon hydrogen and fuels

08/07/2025 |European Commission| **Link**

Today, the European Commission reaffirms its commitment to supporting the development of a hydrogen market by introducing a comprehensive greenhouse gas emission methodology for low-carbon hydrogen and fuels, as set out in the Hydrogen and Gas Market Directive. This methodology complements the existing ones on renewable hydrogen and renewable fuels of non-biological origin (RFNBOs), completing the EU's regulatory framework for hydrogen.
This is a pivotal step that provides a clear regulatory framework, unlocking investment certainty and accelerating the scale-up of clean hydrogen production across Europe.

8 Australia introduces new 'community benefit' requirements to key green hydrogen subsidy programme

08/07/2025 | Hydrogen Insight| **Link**

Australia has implemented new community benefit requirements for its flagship green hydrogen subsidy programme under the Future Made in Australia Act. These rules mandate that projects receiving public funding must provide clear and measurable benefits to local communities. This includes creating local jobs, investing in workforce skills, engaging with First Nations communities, promoting diversity and inclusion, and ensuring tax transparency. The objective is to align hydrogen development not only with environmental goals but also with social and economic priorities, reinforcing public support and long-term project sustainability.

9 Launch of Project Development Assistance (PDA) Programme for Hydrogen Valleys – Applications Open 11 July

11/07/2025 | Clean Hydrogen Joint Undertaking | **Link**

The PDA programme offers tailored expert support services in commercial, technical, regulatory and governance dimensions to advance Hydrogen Valleys across the European Union and in countries associated to Horizon Europe towards the Final Investment Decision (FID). With this Call for Applications, up to 15 PDAs in total (light and plus) will be awarded to eligible projects.
Depending on the project's overall maturity, applications are possible for one of the two PDA tracks:

- PDA light (6 weeks): Support for early-stage projects to build a detailed pre-feasibility project concept.
- PDA plus (12 weeks): Modular assistance to help projects with a concept study in place advance towards the feasibility milestone, including a detailed roadmap to FID.

NOTÍCIAS

Corredores de Hidrogénio: Aspetos Normativos e de Promoção

10 EU massively boosts budgets for cross-border transport and energy funds that provide cash for hydrogen projects

17/07/2025 | Hydrogen Insight | **Link**

The European Union has significantly increased funding for two major programs — the Connecting Europe Facility (CEF) for Energy and Transport — with budgets rising by more than 60% and 75%, respectively, for the 2028–2034 period. These funds are essential to support the development of cross-border hydrogen infrastructure, including pipelines and storage, as part of the EU's commitment to decarbonisation and energy security. Projects related to the European Hydrogen Backbone and hydrogen refuelling corridors are expected to benefit directly. The funding increase reflects the growing strategic importance of hydrogen in Europe's green transition and aligns with goals outlined in REPowerEU and the European Green Deal.

11 Dutch government announces 11 winners of near-billion-euro green hydrogen subsidy auction

18/07/2025 | Hydrogen Insight | **Link**

The Dutch government has awarded €839 million in subsidies to 11 green hydrogen projects with a combined electrolysis capacity of 1.15 GW. The selected initiatives, involving companies like Shell, BP and RWE, are mainly located in strategic ports such as Rotterdam and Eemshaven. The subsidies aim to support the initial years of operation, making green hydrogen more economically viable. Projects must be operational by 2028, reinforcing the Netherlands' position as a key player in Europe's hydrogen strategy.

12 Innovation Fund: six additional projects supporting the decarbonisation of European industry

22/07/2025 | European Commission | **Link**

Today, six projects from the Innovation Fund 2023 general call for Net-Zero Technologies (IF23 Call) reserve list have signed their Grant Agreements. This brings the total number of projects supported under this call to 83, notably including the first Innovation Fund project located in Luxembourg. Together, these six new projects will benefit from a total of nearly €319 million in grants financed via the EU Emissions Trading System.

These six projects aim to reduce 24.1 million tonnes of CO_2 equivalent over the first ten years of operation. They will deploy innovative decarbonisation technologies in the hydrogen, hydro/ocean energy, energy storage (other) and refineries and chemicals sectors.

NOTÍCIAS

Corredores de Hidrogénio: Aspetos Normativos e de Promoção

13 Chile proposes $2.8bn green hydrogen tax credit to stimulate domestic demand

22/07/2025 | H2 View| **Link**

The Chilean government has proposed a $2.8 billion tax credit to accelerate domestic demand for green hydrogen. The measure would cover up to 50% of production costs for projects developed between 2026 and 2030. It is part of a broader national strategy aimed at building a robust local hydrogen value chain, encouraging early market adoption, and reducing investment risks. This initiative includes complementary public funding mechanisms, regulatory frameworks, and the establishment of a ministerial committee to coordinate efforts. It targets industrial applications such as green ammonia, green methanol, and low-emission fuels, positioning Chile as a global leader in green hydrogen production and use.

14 An update on the UK hydrogen policy progress

23/07/2025 | Hydrogen Europe| **Link**

In July 2025, the UK advanced its hydrogen policy by selecting 11 projects under HAR1 (125 MW capacity) and reinforcing support through the Hydrogen Business Model and LCHS. Upcoming funding rounds and new frameworks for transport and storage are planned. The UK is also strengthening its position in international hydrogen trade and coordination.

15 Project Development Assistance (PDA) Programme for Hydrogen Valleys – Recording and Presentation of Info Day

23/07/2025 | Clean Hydrogen Joint Undertaking | **Link**

On July 18, a virtual Info Day on the Call for Applications for Project Development Assistance (PDA) programme for Hydrogen Valleys took place with over 150 interested participants.
The recording and the presentation of the Info Day is available here:
Recording and presentation of the Info Day
The PDA programme offers tailored expert support services in commercial, technical, regulatory and governance dimensions to advance Hydrogen Valleys across the European Union and in countries associated to Horizon Europe towards the Final Investment Decision (FID).
With this Call for Applications, up to 15 PDAs in total (light and plus) will be awarded to eligible projects.

16 Aprovados 17 projetos para produção de hidrogénio e gases renováveis

28/07/2025 | Governo Portugal| **Link**

RECUPERAR PORTUGAL

No âmbito do PRR, foram aprovados mais 17 projetos empresariais para reforço da capacidade nacional de produção, armazenamento e distribuição de hidrogénio renovável e outros gases renováveis, num total de 70 milhões de euros.
Segundo o Ministério do Ambiente e Energia, os projetos selecionados oferecem "soluções inovadoras de produção, contribuindo para a descarbonização da economia, redução da dependência energética e criação de emprego qualificado".
Maria Graça Carvalho, Ministra do Ambiente e Energia, afirma que "este investimento público é mais um passo firme para acelerar a independência energética do país, valorizar a inovação nacional", ressalvando que "Portugal está a contribuir com clareza para a nova geopolítica da energia limpa".

17 CEF Energy: paving the way for a green shipping corridor from Portugal to Northern Europe

28/07/2025 | CINEA | **Link**

The Commission has today published its Opinion (C/2025/2004) on the statutory documents of the European Network of Network Operators for Hydrogen (ENNOH) – the independent association representing future hydrogen transmission network operators at EU level. Detailing the Commission opinion on the draft articles of association, rules of procedure and list of members of ENNOH, this document is an important step in the process of establishing ENNOH. In its findings, the Commission flags the need to allow operators to start cooperating as soon as possible through ENNOH, while ensuring a framework that is in line with the EU legislation. This echoes the earlier opinion from the Agency for the Cooperation of Energy Regulators (ACER).

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PUBLICAÇÕES

Produção de Hidrogénio

1 Optimizing Regional Hydrogen Energy Layout with Cost Variations in Renewable Hydrogen Production under Electricity-Hydrogen-Carbon Coupling

Ru Li et al. Renewable Energy, vol. 256.Part B.(2025) **Link**

Abstract The development of green hydrogen energy is crucial for achieving a low-carbon energy transition. Existing research has overlooked the practical demand for inter-regional hydrogen energy scheduling and the potential for future cost reductions in renewable energy-based hydrogen production. To address these gaps, this study establishes an optimization model for hydrogen energy distribution across seven regions in China, incorporating electricity prices, technological advancements, and hydrogen industry development trends. The results indicate a significant reduction in China's hydrogen production costs. By 2060, the average production cost will decrease to 8.94 CNY/kg. The share of hydrogen production in renewable energy will rise to 60%-100% by 2060, with PEM-based production accounting for 24%-60%. The carbon emission reduction potential of hydrogen energy production can reach 1040.5 Mt-1734.2 Mt by 2060. The Southwest region will become the primary exporter of hydrogen, contributing 36.9% of the inter-regional hydrogen transmission. The South will be the largest importer, with hydrogen imports reaching 20.46 Mt by 2060. This study offers strategies to reduce renewable hydrogen costs, optimize production structures, and enhance transmission through technological innovation and market mechanisms, promoting efficient energy use and an integrated hydrogen network.

2 Research on multi-time scale optimization strategy for PV-electrolyzers hydrogen production system based on MPC

Xinrui Liu, Huixin Hong, Yufei Liu, Rui Wang, Junhui Li, Zhengmao Li, Qiuye Sun, International Journal of Hydrogen Energy, vol. 157, 2025 **Link**

Abstract Hydrogen production from new energy power generation is an effective measure to achieve energy transformation, low carbon and clean hydrogen production. To reduce the cost of hydrogen (COH) production, improve the utilization rate of photovoltaic (PV) power generation and deal with PV uncertainty, this paper proposes a multi-time scale optimization strategy for PV-electrolyzers hydrogen production system based on model predictive control (MPC). Firstly, for the hydrogen production system, a rotation operation strategy is proposed based on the characteristics of alkaline electrolyzers (AELs), and an AEL management system(AEMS) is configured to manage the operation and health status of the electrolyzers. The multi-electrolyzer rotation operation strategy is integrated into the optimization strategy. Secondly, with the optimization objective of minimizing the cost, the electricity purchase cost function here is newly defined to guide the system to produce more hydrogen during low electricity price periods. Finally, a two-layer optimization scheduling framework based on MPC is proposed to improve system's economic efficiency while correcting deviations of day-ahead scheduling. The simulation results show that the power range of the electrolyzer is extended and the improved rotation operation strategy enhances the balance between electrolyzers. The MPC-based optimization strategy effectively coordinates the operation of electric and hydrogen hybrid energy storage. In addition, the proposed strategy increases the average hydrogen production of the hydrogen production system by 20% and reduces the cost of hydrogen (COH) by 3%.

3 Production of hydrogen energy from graphene-based catalytic technologies

Chika Oliver Ujah, Peter Apata Olubambi, Journal Fuel vol. 404 (Part B), July 2025 **Link**

Abstract This comprehensive review aims at investigating graphene-based technologies in boosting hydrogen production via three methods including electrocatalysis, photocatalysis and plasma-assisted reforming. Graphene stands out as an excellent catalytic material due to its exceptional attributes which include large surface area, exceptional electrical and thermal conductivity, adjustable electronic properties and outstanding mechanical strength. The research explores graphene's contributions to hydrogen evolution through three main strategies including lowering energy barriers, escalation of active sites and enhanced electrical charge transport. The study also focuses on graphene's performance when functionalized with metal catalysts and heteroatoms, enhancing its capability in charge separation and absorption of light during photocatalysis. The application of plasma to

graphene improves catalytic reaction in hydrogen production with improved resistance to energy consumption. Large-scale industrial adoption of this technology remains restricted in terms production cost, synthesis scalability and environmental safety issues. The research suggests an outlook for enhancing production technologies, improving process sustainability, and tackling scale-up technology to boost graphene's incorporation into green and effective hydrogen energy production.

4 Process Simulation of a Dual Fluidized Bed Ca-Looping Biomass Gasifer with CuO/CaO for Enhanced Hydrogen Production

Han Saem Park et al., Korean Journal of Chemical Engineering, vol.42, nº9, July 2025 **Link**

Abstract In this study, H_2 production through Calcium-Looping (Ca-Looping) gasification process using biomass feedstocks, including wood waste (WW), cow manure (CM), and biocrude (BC), was investigated. This novel system employed a dual fluidized bed system, comprising a gasifier reactor with a mixture of CuO and CaO fluidized by steam, and a regenerative air reactor. Hydrogen production was investigated as a function of variations in key operating parameters, including gasification temperature (T_g), equivalence ratio (E/R), steam mass flow rate (M_{steam}), and CaO circulation rate (C_{CaO}). Enhancement in hydrogen production was not observed at temperatures above 700 °C for all feedstocks, which was confirmed to be due to the deactivation of the carbonation reaction. An increasing CO_2 volume fraction and decreasing H_2 volume fraction in the synthesis gas were observed as the E/R ratio increased. Additionally, H_2 production increased continuously with higher steam flow rate. CO_2 capturing capacity, through carbonation of CaO increased with CaO circulation rates, reaching a plateau as the circulation rate reach above 100 kg/hr. These findings highlight the potential of the biomass Ca-Looping gasification process to produce high-purity H_2 while significantly reducing CO_2 emissions, positioning it as a promising pathway for sustainable energy production.

5 Performance evaluation of an innovative solar powered air-based hydrogen production system

Mahmoud M. Abd-Elhady et al., Jouranl Renewable Energy, vol.256, July 2025 **Link**

Abstract This study examines the performance of an innovative solar-powered air-based hydrogen production system (SAHP) addressing the challenges of freshwater scarcity in hydrogen production. The SAHP includes an electrolyzer that uses a hygroscopic solution to extract water vapor from ambient air, eliminating dependence on traditional freshwater sources. Experimental tests were carried out to quantify the hydrogen production rate, the absorption rate of water vapor by the hygroscopic electrolyte, the power consumption, and faradaic efficiency under various values of relative humidity and air temperature. It was found that the proposed system could produce hydrogen up to 1.365 L/h corresponding to a current density of 310 mA/cm_2 under operating conditions of 25 °C air temperature, 80 % relative humidity and 30 %wt. acid concentration. The results also show that the system works efficiently in a wide range of climate conditions, achieving a significant hydrogen production rate with minimum energy consumption. This study presents a promising alternative for sustainable hydrogen production, especially in arid regions with solar energy resources but limited freshwater access.

PUBLICAÇÕES

Células de Combustível

1 A joint strategy of energy management and energy braking recovery for fuel cell vehicles considering ultracapacitor

Jing Zhang et al., Results in Engineering, July 2025 **Link**

Abstract The hybrid energy storage system composed of fuel cell, battery, and ultracapacitor holds significant potential in fuel cell vehicles. However, most of the current research only solely consider energy braking recovery or merely focus on energy management, with few conducting joint research on the two. To address the issues of short fuel cell lifespan, low energy braking recovery efficiency, and the complexity of overall vehicle power distribution and energy flow, this paper proposes a method for joint energy management and energy braking recovery of fuel cell vehicles based on fuzzy control and considering ultracapacitor. This approach integrates the energy braking recovery strategy with the energy management strategy. Through secondary development of the Advisor software and addition of an ultracapacitor module, modeling of energy braking recovery module and energy management module is carried out. On this basis, a fuzzy controller is designed to control the aforementioned energy braking recovery module and energy management module, enhancing the overall performance of the fuel cell vehicle. The proposed joint strategy can reduce hydrogen consumption by 16.59% and 10.99%, and reduce the fuel cell life decay rate by 58.68% and 64.63% under NEDC and UDDS conditions, respectively.

2 Boron-phosphorus dual-doped graphene supported AuPd nanocatalyst for high-efficiency direct methanol and formic acid fuel cells: Toward sustainable energy solutions

Qin, Ze et al., Journal Fuel, vol.404 (PArt A) July 2025 **Link**

Abstract Direct methanol fuel cells (DMFCs) and direct formic acid fuel cells (DFAFCs) are promising energy conversion technologies due to the high energy density and environmental compatibility. Nevertheless, the widespread application has been hindered by the lack of efficient and durable electrocatalysts capable of simultaneously addressing sluggish reaction kinetics and catalyst poisoning. Herein, a boron-phosphorus dual-doped graphene (BPG) supported AuPd nanoparticles (NPs) is successfully synthesized via a straightforward chemical reduction approach. Au-Pd alloying has modulated the d-band center of Pd, changed the electronic structure of Pd, and also generated a significant bimetallic synergistic effect, thus enhancing the resistance to CO poisoning and improving the performance of the catalyst. Moreover, the BPG support with high defect density and enhanced electron transport capability facilitates uniform nanoparticle dispersion and stabilizes catalytic intermediates. Compared to commercial Pd/C (0.42 A mgPd-1 for MOR and 0.53 A mgPd-1 for FAOR), the Au0.4Pd0.6/BPG catalyst demonstrates superior mass activities of 6.16 A mgPd-1 for MOR and 10.10 A mgPd-1 for FAOR. In addition, the Au0.4Pd0.6/ BPG catalyst exhibits excellent long-term durability in both alkaline methanol and acidic formic acid solutions. This study provides a strategic design for supported bimetallic catalysts, which accelerates the development of high-performance fuel cells. This development is consistent with the United Nations Sustainable Development Goals (SDG), specifically SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action), by fostering the development of energy conversion technologies that are both low-emission and efficient and that are suitable for off-grid and portable power applications.

3 Grid-connected Fuel Cell Power Generation System Based on Grid Current Feedback and Capacitor Current Active Damping

Hosseinpour M. et al., International Journal of Engineering, Transactions B: Applications, vol.39, nº 3, pp.756 - 769, July 2026 **Link**

Abstract Grid-connected inverters connect distributed generation and renewable energy sources to the grid. Various filters, including inductor-capacitor-inductor (LCL) filter, are utilized to increase the quality of grid-injected power. In addition to the inherent resonance of the LCL filter, the weak network with variable network impedance leads to instability of the power transmission system. This paper aims to improve the injection power quality of the LCL filter-based grid-connected fuel cell with control based on the grid current feedback and capacitor current

active damping. Although active damping can theoretically guarantee the grid-connected passive inverter behavior, the system performance is sensitive to both the current controller phase lag and the variations of the filter parameters. To control these two factors, a suitable phase compensator has been proposed to enhance the passive behavior. In this paper, the control of LCL based grid-tied fuel cell power conditioning system with control based on LCL filter-based utilizing the grid current feedback and capacitor current active damping scheme has been studied, and the passive and stable performance of this system has been evaluated considering the effect of the current regulator phase compensation. The process of systematic design of the control system parameters has been described with necessary details and the passive performance of the grid-connected system has been evaluated. The obtained results for the simulation of the grid-connected fuel cell power optimization system indicate the current injection with very high quality and the passive behavior of the system under variations in the impedance of the weak network.

4 Characteristics of electrochemical reaction process in the proton exchange membrane fuel cell considering the bio-inspired crescent-shaped dot matrix substrate flow field structure

JMiao, Weizhi et al., Journal Fuel, vol.404, July 2025 **Link**

Abstract The cathode flow field (FF) of proton exchange membrane fuel cells plays a pivotal role in optimizing oxygen mass transport, facilitating the efficient removal of liquid water, and maintaining stable electrical contact. These functions are critical for sustaining the electrochemical reaction rate, mitigating flooding risks, and reducing concentration polarization losses. This study systematically investigates the influence mechanisms of FF configurations, geometrical features of bio-inspired crescent-shaped dot matrix (BICSDM), dimensional parameters, and arrangement patterns on fuel cell performance, utilizing a single-objective parameter optimization strategy. Comparative analysis of FF architectures indicates that the “channel-ridge” configuration exhibits superior performance, achieving a 5.95 % enhancement in peak power density relative to the non-contact BICSDM configuration. This improvement substantiates the essential role of ridge structures in facilitating effective electron conduction. Geometric evaluations of BICSDMs reveal that the fourth configuration demonstrates the lowest pressure drop; however, it poses a flooding risk on large-area bipolar plates. In contrast, the second configuration shows a decline in performance due to the retention of liquid water. Investigations into dimensional parameters show that when the outer radius reaches 0.7 mm, the output voltage increases by 0.82 %, attaining optimal performance. However, further enlargement of the inner radius leads to a marked reduction in current density and intensifies the accumulation of liquid water. Ultimately, optimization of the arrangement strategy identifies the staggered configuration as the most effective, exhibiting superior performance in pressure drop management, uniform oxygen distribution, and voltage output. This configuration offers a promising pathway to achieve a balanced trade-off among performance, pressure drop, and mass transport distribution.

5 A review of electrode poisoning in fuel Cells: Strategies for mitigation and performance enhancement

Timileyin Aworinde et al., Journal of Power Sources, vol.655, July 2025 **Link**

Abstract Fuel cells present a hopeful future to produce clean energy in a range of applications, but their effectiveness is frequently affected by electrode poisoning. This article investigates some common types of electrodes poisoning that can occur in fuel cell systems, such as carbon, sulfur, hydrogen (in ammonia fuel cells), and chromium poisoning. We investigate the causes, effects and methods of reducing the harm for the forms of poisoning highlighted above, emphasizing the difficulties they present, and the approaches used to address them. This review seeks to gain insights into the phenomena of electrode poisoning and offer new directions for future research and development by collating newly emerging and already knowledge. By tackling the difficulties caused by electrode poisoning, we may enhance the dependability, effectiveness, and profitability of fuel cell technology, thereby contributing to a sustainable energy future.

PUBLICAÇÕES

Tecnologia de Armazenamento de Hidrogénio

1 Near-ambient temperature enhancement of hydrogen storage in thermally reduced graphene oxide to 6.53 wt% after porous silicon nanoparticles decoration

Neeraj Kumar Nishad, Paresh Kale, Journal of Energy Storage, vol.131 (Part B), July 2025 **Link**

Abstract Graphene materials are promising for hydrogen storage due to their lightweight, high surface area, and ability to adsorb hydrogen on the surface. However, the adsorption capacity at ambient temperature is significantly less due to lower bond strength (low isosteric heat of adsorption) and can be improved by surface tailoring. Decorating porous silicon (PS) on thermally reduced graphene oxide (TrGO) sheets boosted the hydrogen storage capacity by increasing high-energy active sites via changing the surface properties from charge transfer. Charge transfer due to PS interaction with TrGO is confirmed by XPS analysis and hydrogen storage capacity measurement using PCT-Pro. TrGO shows a storage capacity of 3.74 wt% while the TrGO-PS composite exhibited a significantly enhanced capacity of 6.53 wt% at 40 °C and 50 bar. Decoration with PS helps TrGO to improve isosteric heat, improving the thermodynamic stability of the composite.

2 Understanding caprock integrity in underground hydrogen storage: A geochemical study of mineral alteration and sealing efficiency

Milad Hashemi, Behnam Sedaee, International Journal of Hydrogen Energy,vol.154, July 2025 **Link**

Abstract Underground hydrogen storage (UHS) in aquifers has emerged as a promising large-scale energy storage solution, crucial for enabling the transition to renewable energy systems. Ensuring the safety and long-term reliability of UHS is essential to support increased adoption and integration of renewable energy sources into existing energy infrastructures. However, the success of UHS systems depends not only on effective management of the physical properties of reservoirs but also on a comprehensive understanding of the geochemical interactions between hydrogen and the surrounding rock formations, especially the caprock. While existing literature predominantly addresses geochemical reactions within the reservoir, research focusing on hydrogen-induced mineral alteration that may affect caprock integrity remains limited. This study aims to bridge this critical gap by investigating the geochemical interactions between hydrogen and caprock minerals and their subsequent impact on caprock integrity and hydrogen leakage potential. Numerical simulations were performed to assess the effects of varying pH, temperature, pressure, and salinity on the porosity, permeability, and sealing capacity of the caprock. The results reveal that hydrogen interactions with key minerals, such as calcite and dolomite, induce significant alterations in the physical and chemical properties of the caprock, potentially compromising its sealing effectiveness. Under acidic conditions, mineral precipitation leads to a reduction in caprock porosity over 0.05 %, whereas under alkaline conditions, a slight increase in porosity is observed. Elevated temperatures further accelerate geochemical reactions, intensifying the changes in porosity. Pressure significantly influences geochemical processes with lower pressures facilitating mineral dissolution and increasing porosity, which increases leakage risk. In contrast, higher pressures suppress geochemical reactions, enhancing the caprock's sealing integrity. Additionally, salinity was found to influence caprock integrity, with higher salinity promoting halite precipitation, which reduces porosity by 0.2 % and has a related effect on permeability, thereby enhancing the sealing efficiency of the caprock and mitigating hydrogen leakage. These quantitative findings provide valuable insights for practical decision-making in UHS projects, highlighting the importance of managing geochemical conditions to enhance caprock stability and minimize leakage risks. Effective optimization of these conditions is essential for ensuring the long-term efficiency and viability of UHS systems.

3 Research progress in solid-state hydrogen storage alloys: A review

Chen Kang et al., Journal of Materials Science & Technology, vol.246, July 2025 **Link**

Abstract Promoting the widespread utilization of hydrogen energy, supported by efficient storage and conversion technologies, represents a pivotal strategy for addressing global energy and environmental challenges. Among these technologies, the development of compact, safe, and economically viable hydrogen storage (abbreviated as H-storage) solutions is essential for advancing a hydrogen-based economy. Conventional technologies, such as

compressed gaseous hydrogen and cryogenic liquid hydrogen, face limitations including safety concerns, high energy consumption, and significant evaporation losses. In comparison, metal hydride-based storage offers a promising alternative by enabling hydrogen to form stable compounds with metals under moderate conditions, thereby improving safety and hydrogen density (Hdensity). The review provides a comprehensive analysis of recent advances in the most appealing solidstate hydrogen storage alloys (HSAs), with a focus on their de-/hydrogenation properties and cycling stability. Key materials discussed include V-based body-centered cubic (BCC) HSAs, Mg-based crystalline and amorphous HSAs, and multi-component alloys-either employed as used as standalone H-storage materials or as multifunctional catalysts to improve hydrogen kinetics of Mg-based materials. The review begins by examining synthesis methods for HSAs. Afterwards, the review summarizes and discusses the H-storage properties of the above HSAs, with a particular emphasis on their de-/hydriding kinetics, thermodynamics, and cycling performance. In addition to highlighting the latest advancements of solid-state HSAs in the field of hydrogen energy, the remaining challenges and prospects of the emerging research are also discussed. (c) 2025 Published by Elsevier Ltd on behalf of The editorial office of Journal of Materials Science & Technology.

4 Geometric feature-based machine learning-assisted exploration of ort-M2B2 structures for room-temperature hydrogen storage

Peng, Tiren et al., Journal of Materials Science & Technology, vol.246, pp.1-12 July 2025 **Link**

Abstract The quest for efficient and stable solid-state hydrogen storage materials at room temperature remains a formidable challenge. This work presents a machine learning (ML)-guided framework to systematically evaluate the hydrogen storage performance of orthorhombic MBene (ort-MBene) materials. A comprehensive set of 18 ort-MBenes was investigated using density functional theory (DFT), revealing a strong correlation between their geometric characteristics and the charge transfer of the transition metals. Through this integrated ML-DFT approach, five promising MBene structures-Ti2B2, Cr2B2, Mn2B2, Zr2B2, and Hf2B2 -were identified, exhibiting exceptional hydrogen adsorption capacities with preferential adsorption occurring at two bridge sites. The analysis of feature importance and Shapley additive explanations revealed that structural parameters such as the ratio of lattice constants (b/a) and the length of bonds (AL) were critical in determining adsorption stability, accounting for 71% of the variance in adsorption energy (Eav). Crucially, Ti2B2 demonstrates room-temperature viability: AIMD simulations confirm rapid hydrogen release (3.27 wt% within 0.5 ps) at 30 0-40 0 K. The results show that this ML-DFT framework can effectively accelerate the discovery of novel hydrogen storage materials, advance the fundamental design principles of MBene-based hydrogen adsorption materials, and serve as a valuable tool for future developments in the field of solid-state hydrogen storage. (c) 2025 Published by Elsevier Ltd on behalf of The editorial office of Journal of Materials Science & Technology.

5 Liquid hydrogen carriers for clean energy systems: A critical review of chemical hydrogen storage strategies

Natacha Diane Ngasse Moudio et al., Journal Fuel , vol.404 (Part B), July 2025 **Link**

Abstract Hydrogen is a key enabler of the low-carbon energy transition, yet its storage and transport remain major challenges. Among emerging solutions, chemical hydrogen storage via liquid hydrogen carriers (LHCs) such as ammonia, methanol, formic acid, and liquid organic hydrogen carriers (LOHCs) offers significant advantages in energy density, safety, and infrastructure compatibility. This review critically examines recent developments in LHCs, focusing on catalytic hydrogenation and dehydrogenation processes, novel catalyst systems, and efficiency improvements. We compare the techno-economic feasibility of leading LHCs, analyze their thermochemical properties, and highlight real-world applications in transport, power, and industrial sectors. Challenges such as catalyst degradation, high energy input for hydrogen (H_2) release, and environmental impacts are discussed, along with emerging solutions like low-temperature catalysis and renewable integration. This work identifies key research gaps and proposes future directions to accelerate the deployment of LHCs in the hydrogen economy.

PUBLICAÇÕES

Distribuição de Hidrogénio

1 Gaseous hydrogen permeation in X65 D pipeline steel and a preliminary evaluation of the influence of oxygen

Maximilian Röthig,International Journal of Hydrogen Energy, vol.158, July 2025 **Link**

Abstract The dissolution of gaseous hydrogen into pipeline steel has been previously shown to be influenced by the presence of oxygen in the hydrogen gas. This study reports on hydrogen permeation experiments using vintage X65 D pipeline steel extracted from the Dampier Bunbury Natural Gas Transmission Pipeline. The aim was to quantify the effect of oxygen on hydrogen permeation. A gas-phase permeation apparatus was designed and built. A permeation model incorporating the appropriate boundary conditions was derived. The hydrogen concentration dissolved in the X65 D using pure hydrogen in these experiments was considerably lower than previously reported. The first set of permeation experiments with hydrogen gas containing oxygen found no effect of oxygen on hydrogen permeation (for oxygen concentrations of 100, 300 and 1000 ppm) with a hydrogen pressure of 81 bar. The second set of permeation experiments found a slight effect of oxygen (for oxygen concentrations of 100, 5000 and 12000 ppm) with a hydrogen pressure of 94 bar. The steady-state hydrogen permeation flux slowly recovered to the value measured in pure hydrogen. This indicated that preadsorbed oxygen initially impeded hydrogen uptake and dissolution in the steel but was not an effective long-term measure to lower the hydrogen in solution in the X65 D under these conditions.

2 Failure analysis of pipelines containing a crack-in-corrosion defect considering hydrogen-induced degradation

Anqing Fu et al., International Journal of Hydrogen Energy, vol.154, July 2025 **Link**

Abstract In this work, a 3D finite element model was developed to perform a failure analysis of a blended hydrogen natural gas pipeline containing a crack-in-corrosion (CIC) defect. Two dimensionless indicators ($P_{crack-corrosion}/P_{corrosion}$ and De) were used to quantify the synergistic effect of hydrogen-induced degradation (HID), internal pressure, and combined defects on the failure pressure of the pipeline. Parametric studies results demonstrated that the pipeline is prone to brittle fracture failure caused by cracks rather than plastic collapse due to corrosion under a higher hydrogen concentration operating environment (i.e., whenever the hydrogen blending ratio exceeds 10 vol%). The presence of a crack reduced the failure pressure by at least 58 % of the corresponding pipelines containing a single corrosion defect. The HID effect can enhance the degradation effects on pipeline failure pressure. Failure pressure exhibits the highest sensitivity to hydrogen blending ratio, followed by corrosion depth, crack length, crack depth, corrosion length, and corrosion width.

3 Thermal decomposition of lignin under hydrogen atmosphere: A ReaxFF molecular dynamics study

Yin, Linjia et al., Journal Fuel, vol.403, July 2025 **Link**

Abstract Hydropyrolysis has been identified as a promising approach for generating fuels and high-value chemicals. However, the reaction mechanism under hydrogen conditions remains to be explored. In this study, ReaxFF molecular dynamics simulations were employed to investigate the detailed reaction pathways of a structurally representative Adler softwood lignin model. By systematically varying hydrogen pressure and temperature, the influence of hydrogen availability on product distribution, bond cleavage behavior, and the evolution of reactive intermediates was elucidated. The simulations, supported by our previous experimental observations, demonstrate that elevated hydrogen pressures enhance deoxygenation efficiency and selectively promote the formation of low-oxygen hydrocarbons. Key radical species such as H center dot, CHO center dot, and CH3 center dot were identified as crucial participants in the dominant reaction pathways, with their generation significantly facilitated under high hydrogen concentrations. Additionally, higher temperatures further intensified bond dissociation and product evolution. In summary, this study offered valuable insights into lignin pyrolysis with the introduction of hydrogen.

4 Joint planning of distribution and transmission system for offshore wind farms integrated with hydrogen production platforms

Rongsen Jin et al., Applied Energy Journal, vol.394, July 2025 **Link**

Abstract With the growing sophistication of offshore wind technology, the development of offshore wind-hydrogen system is evolving as a cost-efficient approach to harnessing far offshore wind resource. However, the costs associated with inter-array cables, the offshore hydrogen production platform (OHPP) and the hydrogen pipeline constitute a substantial portion of the capital expenditure (CAPEX) for this hybrid system, underscoring the critical need for optimization in the distribution and transmission system design of offshore wind-hydrogen system. In this study, we introduce an integrated design model for the distribution and transmission system of this hybrid system, considering local wind conditions and various hydrogen production efficiencies, with the aim of minimizing investment cost, expected power losses cost and expected fault loss cost. Given the complexity of this problem, we employ a double-layer framework for solutions. The upper layer utilizes rigorous mathematical proofs to clarify the relationship between optimal OHPP capacity and its location. Meanwhile, the lower layer addresses a nonconvex mixed-integer nonlinear programming (MINLP) problem for jointly optimizing the cable connection layout and OHPP position. Due to its intractability, we construct a relaxed mixed-integer second-order cone programming (MISOCP) model and rigorously prove that its optimal solution aligns with that of the original problem. In our computational experiments, we found that the integrated design model reduces expected costs by an average of 3.88 % compared to solving subproblems separately. Compared with other optimization methods, our optimization framework is both concise and efficient, capable of finding a globally optimal solution within an acceptable timeframe. Lastly, sensitivity analysis reveals that even a slight increase in hydrogen production efficiency can significantly reduce expected costs, each 1 % improvement in efficiency reduces total cost by 0.94 %.

5 Feasibility of the transportation options of renewable hydrogen for moderate distances: Insights from a remote production in Finland

Satu Lipiäinen, Esa Vakkilainen, Energy Conversion and Management: X Journal, vol.27, July 2025 **Link**

Abstract Renewable hydrogen production resources are frequently distant from the users, creating a need for transportation. The purpose of this study is to compare the economics of different transportation options for moderate distances (200 km). The included options are hydrogen transportation using a pipeline, a truck, or a train compared to electricity transmission via grid. The results suggest that transportation costs are 0.1–2.9 €/kg$_{H2}$. Thus, a large portion of renewable hydrogen price could be from transportation. The optimal transportation option depends on the volumes of hydrogen. In large-scale transportation, a pipeline option has a minor effect on the total hydrogen costs. However, both scaling up the production of electricity and hydrogen as well as building the pipeline are large investments and building times are long. Even though the studied transportation distance was short, the need for transportation can cause notable additional costs in comparison to production site with a more optimal location.

PUBLICAÇÕES

Mobilidade Terrestre com Hidrogénio

1 Simulation and safety analysis of hydrogen leakage for hydrogen-powered vehicles in an enclosed parking garage

Jianhao Li et al., International Journal of Hydrogen Energy, July 2025 Link

Abstract To analyze safety issues related to hydrogen leakage from vehicles in parking garages, this paper presents a numerical simulation study using the software FLACS. A model of a garage is established to investigate the effects of different boundary conditions. The optimal layout for ventilation openings was determined. An increasing amount of hydrogen leaked would exacerbate the impact of leakage accidents. The role of exhaust fans in promoting ventilation was explored, in special cases, the presence of exhaust fans can hinder the discharge of hydrogen. Complex flow patterns are generated inside the garage due to natural ventilation and the operation of the exhaust fan. The presence of the partition walls was found to effectively slow down the rate of hydrogen diffusion and enhance the safety of hydrogen leakage events in a parking garage. The paper provides a reference for the safety analysis of hydrogen-powered vehicles in parking garages.

2 Research on rapid refueling of Type-IV hydrogen storage tanks for hydrogen-powered heavy-duty commercial vehicles

Hong Lv et al. Renewable Energy Journal, vol.253, June 2025

Abstract The significant temperature fluctuations during the rapid compression of hydrogen can cause irreversible damage to hydrogen storage tanks. This poses a major challenge for the advancement of hydrogen-powered heavy-duty vehicles where refueling protocols remain underdeveloped. Therefore, a thorough analysis of the temperature variations of hydrogen storage tanks on heavy-duty vehicles during refueling is crucial for ensuring their safe operation. Referring to the refueling protocol for light-duty vehicles (SAE J2601), a three-dimensional computational fluid dynamics model is established to examine the impact of refueling categories, pre-cooling temperatures, and hydrogen incident angles on the temperature rise of a 210 L Type-IV hydrogen storage tank. The results indicate that SAE J2601 can also ensure the safe refueling of heavy-duty vehicles and serve as a reference for refining their refueling protocols. The pre-cooling temperature of 233 K is the optimal choice for heavy-duty commercial vehicles, as it ensures safe and rapid hydrogen refueling within 4 min. The −25° refueling is suitable for heavy-duty commercial vehicles, which improves the temperature distribution inside the tanks, leading to a reduction of 2.6 K in the final maximum hydrogen temperature. This research provides theoretical support for optimizing refueling protocols and the design and installation of valves for heavy-duty vehicles, which facilitates the development of fuel cell vehicles.

3 Hydrogen fuel sampling intercomparisons: challenges in real-life experiments

Thor Anders Aarhaug et al., International Journal of Hydrogen Energy, July 2025 **Link**

Abstract Hydrogen fuel cell electric vehicles (FCEVs) are a pathway for the transport sector to achieving zero emissions. The hydrogen fuel quality is essential and the international standards (SAE J2719, ISO 14687, EN 17124) have been harmonised. However, sampling of hydrogen fuel at the refuelling station has never been compared directly between US, JP and EU strategies. The study presents the results of two sampling inter-comparisons for US-EU and JP-EU strategies. The results showed an overall good agreement on fuel quality according to international standards between sampling methodologies and identified good practices on maintenance (avoiding water ingress) and purging (ensuring sufficient air purging). Furthermore, the study highlighted the need for further investigation on the impact of sample transfer into different container (decanting).

4 Hydrogen-fueled internal combustion engines in combined heat and power (CHP) systems: A decarbonization strategy

Amr Abbass, Energy Nexus, vol.19, July 2025 **Link**

Abstract The worldwide shift to low-carbon energy has generated interest in hydrogen-fueled internal combustion engines, especially when combined with Combined Heat and Power (CHP) systems. This study employs a dualmethod approach that integrates thermodynamic modeling of hydrogen and natural gas internal combustion engines across diverse compression and air-to-fuel ratios, alongside screening tools from the U.S. EPA and the UK Department for Business, Energy, and Industrial Strategy to evaluate technical and economic feasibility. Results indicate that hydrogen engines attain a maximum of 214.6 horsepower and 48.75 % efficiency at a compression ratio of 16, surpassing natural gas in power output while preserving competitive efficiency. Integration with CHP systems facilitates overall system efficiency of up to 85 %, accompanied by a 35 % decrease in greenhouse gas emissions. The paper provides a comprehensive analysis of NOx emissions in CHP-hydrogen engines. It suggests mitigation measures, including lean operation, exhaust gas recirculation (EGR), and heat recovery optimization, to achieve environmental compliance. The study's primary contribution is the formulation of conclusions and the conceptualization of an efficient, energy-saving hydrogen-based combined heat and power model by implementing both thermodynamic cycle modeling and catalog-based system selection. This innovative method presents a practical system evaluation with comprehensive thermal and emissions analysis, providing a solid decarbonization strategy for high-performance, distributed power generation.

5 Research on energy management strategies for ammonia-hydrogen internal combustion engine hybrid electrical vehicles

Song Xu et al., Energy Journal, vol.334, July 2025 **Link**

Abstract A zero-carbon hybrid system combining ammonia and hydrogen in an internal combustion engine (AHICE) leverages their complementary strengths: ammonia provides high energy density and low-cost storage, while hydrogen enables rapid combustion and reduced nitrogen oxide emissions. This synergy addresses carbon-free fuel challenges and enhances energy efficiency. The system integrates a power battery to supplement engine output, allowing the AHICE to operate within its optimal efficiency range and improve fuel economy. Nevertheless, the presence of two power sources in the hybrid power system introduces a greater degree of complexity concerning the control of the power system. Consequently, energy management strategies are required to ensure the reasonable allocation of the power output of the AHICE and the power battery. This work proposes an ammonia-hydrogen hybrid powertrain energy management strategy for passenger cars. Bench testing explored the power output and fuel efficiency of an AHICE, establishing the groundwork for engine modeling. Subsequently, a hybrid powertrain model is developed, and an optimization-based ECMS is introduced to enhance the fuel efficiency of the hybrid system. Finally, the simulation results indicate that the proposed ECMS-D achieves a 5.68 % improvement in fuel economy and reduces the equivalent hydrogen consumption. Moreover, the control strategy reduces the power battery's SOC fluctuation range. This provides the basis for the application of a zero-carbon hybrid system in passenger cars.

PUBLICAÇÕES

Corredores de Hidrogénio: Aspetos Normativos e de Promoção

1 Application of Criteria for Hydrogen Transportation Refueling for Several Countries Considering Energy Resource and Use Implications

Nwala, Vincent Nkem et al., Published ETD Collection - University of Houston, Thesis, July 2025 **Link**

Abstract The transition to hydrogen-based transportation requires strategic evaluation of energy sources, infrastructure, and regional capabilities. This study investigates the feasibility of hydrogen refueling for ground transportation by implementing the established criteria for transitioning from conventional fuels to hydrogen. The United States and the United Kingdom serve as base case studies for defining six primary criteria: feedstock, production, storage, distribution, end-use applications, and policy considerations, including government incentives and public perception. These criteria are then applied to seven additional countries Japan, France, Nigeria, South Africa, Germany, South Korea and China to test their adaptability across diverse geopolitical and energy contexts. The analysis provides a comparative assessment of hydrogen implementation strategies, focusing on technological pathways, environmental impact, economic viability, and infrastructure readiness. Furthermore, the study incorporates Technology Readiness Levels (TRLs) to evaluate the maturity of hydrogen systems within each country. The results highlight significant variation in hydrogen mobility potential due to differences in energy resource availability, infrastructure development, and policy frameworks. Countries with strong renewable energy portfolios and supportive regulatory environments exhibit greater readiness for hydrogen adoption. Conversely, regions lacking cohesive policy or infrastructure face steeper barriers to implementation. Overall, this research offers a structured, criteria-based framework to support decision-makers in designing context-specific hydrogen transportation strategies. It contributes to ongoing efforts in decarbonizing the transportation sector and provides a foundation for future investment and policy development in the global hydrogen economy.

2 Analysis of Prospects and Challenges for the Future Development of Hydrogen Vehicles

Zhirong Yao, MATEC Web of Conferences 410, July 2025 **Link**

Abstract In the context of the global transportation industry, which presently combats environmental pollution and resource scarcity, HPV (hydrogen-powered vehicle) technology stands out as a feasible alternative to electric and ICE (internal combustion engine) vehicles. The current article aims to present a review of the benefits that relate to the usage of HPVs, including FCEVs and HICEs, with the focus on efficiency, emissions, and range. The essay also delves into the current limitations of the existing power sources, emphasizing the factors of technology, economy, and society as the main obstacles to hydrogen adoption. This assessment includes a comprehensive study of hydrogen storage, transportation, infrastructure, production, and public perception. Strategies are designed that could enable transportation with hydrogen to become more feasible. The results indicate that, given the current circumstances, HPVs seem not to be in a position for mass adoption. However, both innovative technologies and policy support can serve as important necessary prerequisites to placing HPVs as one of the pillars for sustainable future transportation.

3 Enhancing safety and operation of hydrogen fueling stations: A model-based method for complex failure scenario analysis

Ruixue Li et al., Process Safety and Environmental Protection Journal, vol.201 (Part B), July 2025 **Link**

Abstract As a zero-emission fuel, hydrogen provides a promising solution with significant potential to meet the increasing demand for clean energy alternatives. Hydrogen fueling stations are essential infrastructure for the commercialization of hydrogen fuel cells, but the flammability of hydrogen poses safety challenges throughout its lifecycle. Past incidents highlight the need for robust risk assessments, starting with comprehensive hazard identification and failure scenario analysis. This paper proposes using Multilevel Flow Modelling (MFM), a functional modeling method integrated with reasoning capability, to support safety evaluations. MFM enables the structured representation of system functions and supports tasks such as fault diagnosis and hazard analysis. Previously applied in nuclear, offshore, and chemical systems, MFM is here used to model a liquid hydrogen fueling station. This paper demonstrates that a developed MFM model identifies failure scenarios related to hydrogen leaks,

overpressure, and operational reliability issues. This paper conducts a comparison between MFM and traditional methods, FMEA and FTA, and demonstrates MFM's strength in handling the key challenges rooted from complex failure interactions. Results suggest MFM is complementary to traditional methods and can enhance risk assessments. MFM also contributes to digitalization in safety assessment and monitoring systems, ultimately improving hydrogen fueling station reliability and safety.

4 Investigation on coupling mechanism of safety accident risk of hydrogen energy system based on N–K model

Shanshan Xing et al., International Journal of Hydrogen Energy, July 2025 **Link**

Abstract The rapidly growing hydrogen energy sector faces the challenge of maximizing its clean energy benefits while managing the associated safety risks. Currently, a comprehensive understanding of the interconnected risk factors contributing to accidents remains elusive, particularly impeding the formulation of robust safety measures. Here, this study addresses this gap by employing the N–K model to elucidate the formation mechanism of coupled risks in hydrogen energy systems. Firstly, the system is divided into four subsystems: human, machine, job and management, risk factors associated with safety accidents in each subsystem are analyzed. Secondly, risks are divided into three categories: single-factor, dual-factor, and multi-factor coupling. The formation mechanism of the coupling risk is analyzed based on the concept of triggers. Thirdly, utilizing the N–K model, the internal coupling relationships and their triggers are quantitatively analyzed. The hydrogen incidents and accidents database (HIAD 2.1) was used as the main source of data, and 92 accident cases with known causes were extracted from the database based on the criterion of whether there were fatal accidents, and an example study was carried out based on the N–K model. The findings of this study reveal that the probability of safety accidents is directly correlated with the magnitude of the risk coupling value, which is influenced by the number of interacting risk factors. Significantly, the machine factor emerged as the predominant determinant of risk coupling. This study highlights the necessity for hydrogen energy systems to strengthen risk prevention mechanisms, rigorously evaluate system designs, and proactively mitigate the potential for multi-factor risk couplings. Implementing these measures will significantly enhance the overall safety of hydrogen energy systems, contributing to the development of more reliable and secure energy solutions.

5 MXenes for hydrogen energy systems: Advances in production, storage, fuel cells, and safety applications

Solomon Evro, I.P. Jain, International Journal of Hydrogen Energy, vol.145, pp.147-168, July 2025 **Link**

Abstract MXenes, the new family of two-dimensional (2D) transition metal carbides, nitrides, and carbonitrides, have shown great potential as materials for hydrogen energy systems. Their conductivity, surface tunability, large surface area, and structural stability render them ideal for hydrogen production, storage, fuel cells, and safety. This article discusses the contribution of MXenes towards the development of hydrogen technologies in surmounting efficiency, scalability, and cost limitations. MXenes electrocatalysts for hydrogen evolution enhance the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER) with enhanced catalytic activity and stability compared to conventional materials. The use of MXenes in proton exchange membrane fuel cells (PEMFCs) is efficient in increasing electrode stability while reducing reliance on platinum catalysts. Beyond PEMFCs, the potential of MXenes is also being explored in other fuel cell platforms such as solid oxide fuel cells (SOFCs), alkaline fuel cells (AFCs), and microbial fuel cells (MFCs), highlighting their broader versatility in hydrogen conversion technologies. MXenes possess better hydrogen storage capabilities via physisorption and chemisorption, enabling reversible hydrogen adsorption with high capacity. Besides, MXenes hybrids with metal hydrides and porous materials improve storage kinetics and temperatures and address major challenges in hydrogen storage. Besides production and storage, MXenes-based sensors for detecting hydrogen provide realtime leak detection with high selectivity and sensitivity, enhancing safety in hydrogen infrastructure. Despite their many advantages, stability under operational conditions, scalability of synthesis, and production costs are present obstacles to commercialization. Future research should focus on optimizing their electrochemical performance, functionalization pathways, and mass production synthesis. MXenes hold great promises to revolutionize hydrogen energy systems and facilitate the transition to a sustainable, low-carbon energy future by improving hydrogen efficiency, safety, and affordability.

EVENTOS

3-4 SEP

HYDROGEN AMERICAS 2025 SUMMIT & EXHIBITION

Washington D.C., U.S.A.

Hydrogen Americas 2025 Summit&Exhibition

The Hydrogen Americas Summit & Exhibition returns to Washington D.C. on 3–4 September 2025. Held at the Gaylord National Resort, it features a strategic summit, Tech Series stage, and product showcase on hydrogen, storage, CCUS, and energy innovations. Under the theme "Defining Hydrogen's Role in Americas' New Energy Landscape," the event explores how hydrogen, renewables, CCS, and other energy sources can together ensure a sustainable system. Gathering policymakers, investors, and industry leaders, it serves as a key platform for insights, collaboration, and advancing clean energy across the Americas.

Link

7-8 OCT

Hy-fcell 2025 – International Exhibition and Conference for Hydrogen and Fuel Cells

The hy-fcell is one of the world's leading international trade fairs and conferences for hydrogen and fuel cell technology. Combining a high-level exhibition and conference, it brings together experts from industry, research, and policy to drive innovation and explore new business opportunities.
Focal topics 2025:

- Production technology – manufacturing fuel cells and electrolysers
- Hydrogen mobility – applications from lorries to aviation
- European Single Market – Strategies for Europe as a business location
- International networking – cooperation and knowledge transfer

Link

12-13 NOV

Wood Mackenzie Hydrogen Conference

With the low-carbon hydrogen economy struggling to move at pace, a boost is needed in the market to reconcile the supply and demand challenges. As the market looks to break the pattern of announcing capacity whilst demand remains relatively small-scale, questions remain around government policy and support, funding and costs, project delivery and end market requirements.
There is also a need to understand market dynamics, conditions and project specific drivers taking projects to FID while stalling others. All these challenges and more, need to be addressed to scale-up the low-carbon hydrogen sector allowing it to play a critical role in delivering as part of the energy transition.

Link

EVENTOS

20-21 NOV

ASIA-PACIFIC HYDROGEN 2025 SUMMIT & EXHIBITION

Sydney, Australia

Asia-Pacific Hydrogen 2025 Summit&Exhibition

The Asia-Pacific Hydrogen Summit & Exhibition 2025 returns to Sydney's ICC on 20–21 November for its largest edition to date. Organized by the Sustainable Energy Council and RX Global, in partnership with the Australian Hydrogen Council and supported by national and state bodies, it is the leading hydrogen event in the region. The summit is a hub for major announcements, partnerships, and innovation in the hydrogen economy. Over 2,500 experts from APAC and beyond will gather to share insights, form alliances, and drive forward hydrogen projects into the 2030s

Link

8-9 DEC

HYDROGEN ARABIA 2025 SUMMIT & EXHIBITION

Riyadh, Saudi Arabia

Hydrogen Arabia 2025 Summit&Exhibition

Join us in Riyadh for the first Hydrogen Arabia conference, showcasing Saudi Arabia's role as a global hydrogen leader and Circular Carbon Economy pioneer. Valued at $1.6 billion, the hydrogen market benefits from Saudi Arabia's resources, strategic location, and strong government backing. Aligned with Vision 2030 and Net Zero 2060 goals, the kingdom is investing heavily in clean energy, including the world's largest green hydrogen plant.

Link

19-21 MAY 2026

WORLD HYDROGEN 2025 SUMMIT & EXHIBITION

Rotterdam Ahoy, Netherlands

World Hydrogen 2025 Summit&Exhibition

The World Hydrogen Summit & Exhibition returns to Rotterdam for its largest edition yet. Organized by the Sustainable Energy Council and RX Global with Dutch government partners, it is the key global meeting for hydrogen industry leaders. Recognized as the place where major hydrogen deals are made, the event fosters strategic partnerships. With 15,000 experts expected, it offers a platform to assess progress, align with decarbonisation goals, and drive new hydrogen project developments into the 2030s.

Link

PROJETOS FINANCIADOS

2025 CEF Energy call for proposals for PCIs and PMIs

Link

Deadline date: 16/09/2025

PCIs are key infrastructure projects aiming at completing the European internal energy market and help the EU to achieve its energy and climate objectives: delivering affordable, secure, and sustainable energy for all Europeans while pursuing a climate-neutral economy by 2050. PMIs are key cross-border energy infrastructure projects between the EU and non-EU countries, which contribute to the energy and climate policy objectives of the Union. Projects selected as PCIs and PMIs can automatically benefit from many advantages stemming from the TEN-E Regulation, including an accelerated permit granting and improved regulatory treatment. Projects on the list can apply for financial support under the CEF Energy programme.

CEF Transport Alternative Fuels Infrastructure Facility (AFIF) call for proposal

Link

Deadline date: 11/06/2025

The objective of the Alternative Fuels Infrastructure Facility (AFIF) call for proposal is to support the deployment of alternative fuels supply infrastructure, contributing to decarbonising transport along the TEN-T network. This second phase of AFIF (2024-2025) will support the objectives set in the new Regulation for the deployment of alternative fuels infrastructure (AFIR) regarding publicly accessible electric recharging pools and hydrogen refuelling stations across the European Union's main transport corridors and hubs, as well as the objectives set in the ReFuelEU aviation and the FuelEU maritime Regulations.

Horizon Europe: EUR 144 million available for projects supporting sustainable, secure and competitive energy supply

Link

Deadline date: 02/09/2025

Following the adoption of the Horizon Europe 2025 work programme, the European Commission has launched a new call for project proposals to support research and innovation in the area of sustainable, secure and competitive energy supply.
The total indicative budget available is EUR 144 million. The deadline for submissions is 2 September 2025.
You can find all the information and documentation required, including the call text and application forms on the Funding and Tenders Portal using the call reference: HORIZON-CL5-2025-02-D3 (12 topics).

LIFE Preparatory Projects (PLP) in the field of Clean Energy Transition

Link

Deadline date: 23/09/2025

On 24 April, the European Commission launched the LIFE Programme Calls for Proposals 2025.
This year, €600 million is available to support projects in the areas of nature conservation, environmental protection, climate action, and the clean energy transition.

PROJETOS FINANCIADOS

GH2M - Accelerating the deployment of green hydrogen mobility in EU regions

Link

Deadline date: 30/06/2028

The transport sector accounts for around 25% of CO_2 emissions in the EU-27, requiring urgent decarbonisation measures. Green hydrogen (H_2) is a promising solution for hard-to-electrify transport segments. However, regional disparities in adoption and policy support persist. GH2M aims to accelerate the integration of green H_2 into sustainable mobility planning across EU regions. The project brings together 9 partners from 8 regions at different stages of H_2 deployment. It focuses on zero-carbon synergies between urban, heavy-duty, and rail mobility. GH2M also addresses policy gaps and fosters regional cohesion. The ultimate goal is to support the EU's 2050 climate neutrality target.

PRHyUS
Promoting Renewable Hydrogen Utilization for a Sustainable and Greener Europe

Link

Deadline date: 31/07/2029

Many European regions are developing hydrogen strategies, but local industries face barriers to adoption. These regions often rely heavily on fossil fuels, with high-emission industrial sectors. Despite investments in renewable hydrogen, scaling its use remains challenging. PRHyUS addresses this by improving regional policies to boost hydrogen demand, cross-sector adoption, and deployment. The project aims to break supply chain barriers and support sustainable hydrogen integration. It contributes to EU climate goals by promoting knowledge and reducing GHG emissions. The consortium includes partners from Italy, Poland, Belgium, Bosnia and Herzegovina, France, Serbia, and Romania. Together, they aim to improve seven policy instruments and create favourable conditions for hydrogen use.

UNIFHY
Unifying policies to support the uptake of green hydrogen to decarbonize Europe.

Link

Deadline date: 30/06/2028

Greenhouse gas emissions in the EU are not falling fast enough to meet 2033 targets. Reducing fossil fuel use while maintaining energy security and jobs remains a major regional challenge. The UNIFHY project explores how green hydrogen can support this transition. It helps public authorities improve energy policies by learning from regional good practices. The project begins with analysing existing hydrogen policies and stakeholder needs. Then, regions match their challenges with tested solutions from partners. UNIFHY will propose policy improvements to support green hydrogen and biogas adoption. If successful, it could drive a Europe-wide shift toward emission-free industry and transport