

European Hydrogen Energy Conference 2022

The logo for the Asociación Española del Hidrógeno (AeH₂). It features the text "AeH₂" in a large, green, sans-serif font. Below it, in a smaller, black, sans-serif font, is the text "ASOCIACIÓN ESPAÑOLA DEL HIDRÓGENO".

AeH₂
ASOCIACIÓN ESPAÑOLA
DEL HIDRÓGENO

**PROGRAM
18-20 MAY**



European Hydrogen Energy Conference

Conference Program

18-20 MAY



The net-zero transition

What it would cost, what it could bring



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H2B2
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Oral Presentations

Thursday, 19th May. Parallel Session 4 (15:00-17:00)

Room A. Hydrogen Production: Renewable

15:00 **Production of hydrogen by solar photocatalytic treatment of wastewaters**

Alberto Puga

Universitat Rovira i Virgili (Spain)

15:20 **Transforming the world's waste into renewable hydrogen for onsite power generation and vehicle fueling**

Jean-Louis Kindler, Angelica Gyllen

Ways2H (USA)

15:40 **Multi-Fuel Compact Renewable Hydrogen Generator for Mobility Applications**

Elisa Alcolea, Jorge Carrero, Juan Manuel Sánchez, Diego Ubeda, Carmen Jimenez-Borja, Ana Nieto, Ernesto Simón, G. Monjas, A. Escobar, J.L. Carreras, C. Fernández-Caballero, M.A Vega

Técnicas Reunidas, S.A. (Spain)

16:00 **MnFe₂O₄-Na₂CO₃ thermochemical cycle for H₂ production: investigating material modification strategies for performance improvement**

Francesco Torre, T. Aguilar, S. Doppiu, M. Oregui, J. Udaeta, N. Uranga, M. Hernaiz, P. Luis, E. Palomo

CIC energiGUNE (Spain); Euskal Herriko Unibertsitatea (Spain); Tekniker (Spain); Ikerbasque (Spain)

16:20 **Comparison of hydrogen production via microwave assisted water splitting in doped-ceria materials**

Aitor Domínguez Saldaña, Laura Navarrete Algaba, María Balaguer Ramírez, Joaquín Santos Blasco, Pedro José Plaza González, José Manuel Catalá Civera, José Manuel Serra Alfaro

ITQ-CSIC-UPV (Spain); Universitat Politècnica de València (Spain)



Oral Presentations

Room A. Hydrogen Production: Renewable

16:40 **Hydrogen production by thermochemical water splitting using La_{0.8}Ca_{0.2}BO_{3-δ} (B=Co, Ni, Cu and Fe) perovskites**

Alejandro Pérez Domínguez, María Orfila del Hoyo, María Linares Serrano, Raúl Sanz Martín, Javier Marugán Aguado, Raúl Molina Gil, Juan Ángel Botas Echevarría
Rey Juan Carlos University (Spain)

Room B. Hydrogen Production: Electrolysis

15:00 **Toward an overall optimization of the anion exchange membrane water electrolysis cell**

Ester López Fernández, Celia Gómez Sacedón, Jorge Gil-Rostrera, Juan Pedro Espinós, Agustín R. González-Élipe, Francisco Yubero, Antonio de Lucas Consuegra
University of Castilla-La Mancha (Spain); ICMS-CSIC-Univ. Sevilla (Spain)

15:20 **Development of a new alkaline electrolyser associated to a renewable offshore plant**

Rodrigo Pérez, David Solera, Rafael Luque
ARIEMA Energía y Medioambiente S.L. (Spain)

15:40 **Alkaline electrolysis at sea: water purification strategies to reduce the levelized cost of hydrogen**

Rafael d'Amore-Domenech, Vladimir Luis Meca, Antonio Villalba-Herreros, Teresa J. Leo
Universidad Politécnica de Madrid (Spain)

16:00 **Modeling the effect of electrolyte recirculation rate in the liquid-gas separators of an AWE on the purity of the gas produced**

Héctor González, E. Amores, D. Abad, M. Sánchez
National Hydrogen Center (Spain)

16:20 **Green hydrogen production based on high efficiency and low degradation pulsed-current electrolysis**

Francisca Segura, José Manuel Andújar, Julio José Caparrós Mancera, Rocío García, Francisco José Vivas
University of Huelva (Spain)

Alkaline electrolysis at sea: water purification strategies to reduce the levelized cost of hydrogen

R. d'Amore-Domenech^{1*}, V.L. Meca¹, A. Villalba-Herreros¹ and T.J. Leo¹

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With a growing offshore wind industry worldwide that consistently evolves towards lower levelized costs of electricity [1], green hydrogen produced at sea will eventually become cost-effective and a competitive energy vector to send bulk power to distant locations [2]. There are different ways to perform the electrochemical water splitting of water at sea, but the most promising ones are the low temperature electrolysis technologies: Alkaline Electrolysis (AE) of water, and Proton Exchange Membrane Electrolysis (PEME) of water [3]. Both electrolysis technologies require water of high-purity to operate. PEME devices are more sensitive to impurities as they are prone to suffer irreversible damages in the Membrane Electrode Assemblies (MEAs), in contrast AE devices can recover from the damage as the deteriorated electrolyte can be easily replaced [3].

Seawater contains different salts in a concentration that typically pivots around 35000 ppm, which varies with time and location [4]. These salts can be removed almost entirely by different mechanisms, being the most popular Reverse Osmosis (RO) and distillation [5]. The cost of the produced water by RO is typically lower, but the water quality is often worse than that obtained through distillation. In any case, the water produced with a single stage of each methods will yield impurity concentrations in water that will lead to short lifespans of the alkaline electrolyte in an AE device [6,7]. Therefore, more stages of RO and distillation must be added to increase water quality, and thus the lifespan of the electrolyte, at the expense of raising the cost.

Producing a water with higher quality will imply a higher cost, but at the same time it will result in economic savings in the periodic replacements of the alkaline electrolyte in AE [7]. The overall effects of water purification strategies in the economic parameters of AE have not been published yet in the scientific literature. It is key to find the water purification strategies that lead to lowest levelized costs of hydrogen (LCOH) to make green hydrogen produced at sea competitive. This work will assess the economic parameters of varying numbers of distillation stages in an AE device, to determine which configuration leads to the lowest LCOH.

References

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- [3] d'Amore-Domenech R, Santiago Ó, Leo TJTJ, D'Amore-Domenech R, Santiago Ó, Leo TJTJ, et al. Multicriteria analysis of seawater electrolysis technologies for green hydrogen production at sea. *Renew Sustain Energy Rev* 2020;133:110166. <https://doi.org/https://doi.org/10.1016/j.rser.2020.110166>.
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