

#ICMoITalks

February 26th - 16:30h 📍 Assembly Hall - ICMol

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**Maria del Carmen
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Hermenegildo García*Instituto de Tecnología Química
(ITQ-UPV-CSIC)***16:30 - Hermenegildo García****Abstract*****MXenos. A New Type of Catalysts***

Complementing two-dimensional nanomaterials, MXenes were first described in 2011 and have had an immediate impact in the field of lithium batteries as cathodes and in supercapacitors, among other applications. This presentation will show that, due to their electrical conductivity and the presence of structural defects, this type of 2D nanomaterials—characterized by a wide variety in their chemical composition—also have applications as electrocatalysts for oxygen evolution, as photocatalysts, and in thermal catalysis. Special emphasis will be placed on the advantages these nanomaterials offer as supports for single atoms and metallic nanoparticles.

Biography

Hermenegildo Garcia (Herme) is full professor at the Technical University of Valencia and it has been working on photocatalysis using metal nanoparticles supported on metal oxides, layered double hydroxides, metal-free graphitic carbon nitride and graphene-like photocatalysts and metal-organic-frameworks, among other materials. Besides pollutants degradation in water and gaseous effluents, he has been working in photocatalytic hydrogen generation and overall water splitting, photocatalytic CO₂ reduction and nitrogen fixation. He has published over 900 research articles and has an H index of 139 according to Google Scholar. He has appeared in the list of Highly-Cited Researchers by Clarivate since the first list was issued in 2014. Among other distinctions, he received the medal of the Spanish Chemical Royal Society in 2011, the Rey Jaime I award on New technologies in 2016, the Spanish National Award in Scientific Research awarded by the Spanish Ministry of Science and Innovation in 2021, the Rylander award given by the North American Catalysis Society in 2024, and the Portuguese-Spanish award in 2025. He is member of the Spanish Royal Academy of Sciences.

17:15 Maria del Carmen Gimenez

Abstract

Advanced Electrocatalysts for Sustainable Energy Conversion and Storage

This seminar will present recent advances in the design and application of functional materials for sustainable energy conversion and storage. The research combines molecular control, nanostructured carbon architectures, and tailored electrode engineering to address key challenges in catalytic efficiency and long-term stability.

Particular emphasis will be placed on the development of durable and selective electrocatalysts for water splitting, fuel cells, and metal–air batteries. Strategies to enhance activity and mitigate catalyst degradation will be discussed, including the selective assembly of metal nanoparticles at carbon nanofiber step-edges to stabilize active sites [1,2], the modulation of oxygen reduction reaction (ORR) selectivity through polyoxometalate–metal nanoparticle interfaces [3], and the design of bifunctional electrodes for efficient water splitting [4–6].

In parallel, the talk will highlight the development of advanced experimental tools to enable deeper mechanistic understanding, including a custom-built automated gas monitoring system [7] and tailored electrochemical cells for operando and in situ spectroscopic studies.

Overall, the seminar will provide an integrated perspective on how materials design, interface engineering, and advanced characterization can be combined to develop next-generation electrocatalytic systems for sustainable energy technologies.

Referencias

- [1] ChemSusChem, 2021, <https://doi.org/10.1002/CSSC.202101236>.
- [2] Advanced Science, 2025 Vol. 12, Núm. 30, <https://doi.org/10.1002/advs.202505104>
- [3] Small Methods, 2024, <https://doi.org/10.1002/smt.202301805>
- [4] Advanced Sustainable Systems, 2023, <https://doi.org/10.1002/ADSU.202300607>
- [5] Advanced Materials, 2025, <https://doi.org/10.1002/adma.202512902>
- [6] Patent ES2796448A1, WO2022/053730, EP21866142, US18/044,41. Title: Battery Compound.
- [7] Patent ES2952195A1, PCT/ES2023/070178. Title: Automated and real-time gas monitoring device

Biography

Maria Gimenez is an Oportunius Research Professor at CIQUS, University of Santiago de Compostela (USC), where her research group focuses on the development and functional characterization of hybrid metal–carbon nanostructures for energy-related applications.

She obtained her PhD in 2006 from the University of Valencia under the supervision of Prof. Coronado and Prof. Romero. She subsequently carried out postdoctoral research at the University of Nottingham with Prof. Champness and Prof. Khlobystov, supported by a Marie Curie Intra-European Fellowship. In 2011, she started her independent research career as a Royal Society Research Fellow and was appointed Assistant Professor of Materials Chemistry in 2015. In 2018, she returned to Spain with a Ramón y Cajal fellowship and joined CIQUS to launch her ERC Starting Grant project. She was later appointed Profesor Contratado Doctor and subsequently Profesor Titular at USC. Dr. Gimenez has received several prestigious grants and fellowships, including an ERC Starting Grant, two ERC Proof of Concept Grants, and more recently an IGNICIA Grant. She has acted as Principal Investigator in more than 20 research projects, co-supervised 10 doctoral theses, and is co-inventor of four patents, one of which has been licensed.

In recognition of her contributions, Dr. Gimenez received the Emerging Investigator Award from the Spanish Royal Society of Chemistry in 2012. She was a finalist for the SRUK/CERU Emerging Talent Award in 2016 and was selected by the Spanish Royal Society of Chemistry to represent Spain at the 10th EuChemS Young Investigator Workshop in 2018, joining a group of Europe's most promising chemists under the age of 40.