IMM Istituto per la Microelettronica e Microsistemi
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Sala Conferenze (DFA – ground floor)

Metal oxide and halide perovskite (photo)electrocatalysts for the sustainable production of added-value chemicals and fuels

Prof. Sixto Giménez

The global society is confronted with two pressing and intertwined challenges: the escalating climate crisis and the urgent need for secure, sustainable energy. Continued dependence on fossil fuels remains a major driver of greenhouse gas emissions, underscoring the necessity of a rapid shift toward cleaner alternatives such as solar and wind power. Within this landscape, (photo)electrocatalysis has become a particularly promising strategy for decarbonizing critical sectors, from power generation to industrial manufacturing and transportation. By enabling the production of renewable energy carriers and value-added chemicals with reduced environmental impact, (photo)electrocatalytic approaches provide a powerful route toward a net-zero future.

In this talk, we will outline some of the major scientific and technological hurdles that (photo)electrocatalytic systems still face, offering a broad perspective on the current status of the field. We will present our contributions on the development of advanced materials, electrode structures, and device architectures aimed at enhancing efficiency, durability, and overall sustainability in energy-conversion and synthetic processes. A key component of our research is gaining a deeper understanding of the fundamental principles governing device function. To achieve this, we employ an extensive range of spectroscopic techniques to interrogate reaction mechanisms and identify the parameters that ultimately influence performance.

Selected examples from our research work will showcase progress in catalyst and material design, system integration, and the implementation of novel device concepts. By bridging foundational insights with applied innovation, this presentation seeks to convey a comprehensive picture of how (photo)electrocatalysis can contribute meaningfully to overcoming today's global energy and climate challenges.

Sixto Giménez is Full Professor at Universitat Jaume I de Castelló (Spain). His professional career has been focused on the study of micro and nanostructured materials for different applications spanning from structural components to optoelectronic devices. During his PhD thesis, he studied the relationship between processing of metallic and ceramic powders, their sintering behavior and mechanical properties. Afterwards, he moved to Katholiek Universiteit Leuven as a postdoctoral researcher, focusing on the development of non-destructive and in-situ characterization techniques of the sintering behavior of metallic porous materials. Since 2008, he works at the University Jaume I and is actively involved in the development of new concepts for photovoltaic and photoelectrochemical devices based on nanoscale materials. He has participated in different European projects and at present coordinates the Pathfinder OHPERA project (grant agreement 101071010).

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