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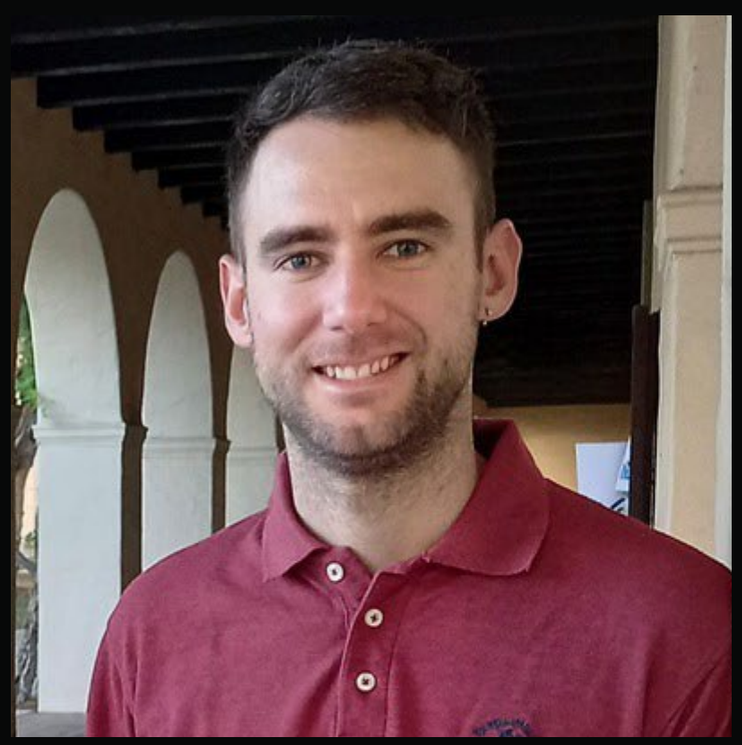
#ICMolTalks

Pablo Garrido Barros

Universidad de Granada

October 27th - 12:00h

Assemby Hall



Abstract

Title: Directing proton–electron interplay for efficient catalysis

Protons and electrons serve as the fundamental currency of energy conversion in both biological and artificial chemical systems. In this context, proton-coupled electron transfer (PCET) has emerged as a key mechanism in developing technologies for renewable energy conversion and sustainable chemical synthesis. The kinetic advantage of PCET over independent proton and electron transfers is crucial in many biological processes and has inspired innovative chemical methodologies. When applied to redox transformations, PCET facilitates the synthesis of value-added chemicals and fuels from unsaturated organic substrates or small molecules such as N_2 and CO_2. However, the extreme redox conditions often required for these transformations can promote competing side reactions (e.g., H_2 evolution in reductive processes), undermining selectivity. While the challenge remains to design selective and broadly applicable PCET reagents, recent years have seen significant advances in both stoichiometric and catalytic systems. In particular, photocatalytic PCET shuttles offer a promising strategy for direct solar energy utilization. This talk will highlight the fundamentals of this reactivity and the recent progress in our group towards developing molecular platforms for photocatalytic PCET, with applications in energy conversion and the synthesis of renewable fuels and chemicals.

Biography

Pablo Garrido Barros obtained his PhD at the Institute of Chemical Research of Catalonia (ICIQ) in the group of Prof. Llobet, where he worked on the development of first-row transition metal catalysts for water oxidation towards artificial photosynthesis technologies. He then conducted postdoctoral research in the Prof. Peters group at Caltech, where he developed proton-coupled electron transfer (PCET) mediators for electrocatalytic transformations, with special emphasis on the reduction of dinitrogen to ammonia. In 2023, he started his independent career as a Ramón y Cajal fellow at the University of Granada, studying the interplay of photons, protons and electrons in photo/electro-catalysis for renewable energy conversion and sustainable synthesis. His research has been recognized by the 2023 Young Researchers Award from the Spanish Royal Society of Chemistry (RSEQ) and recently supported by an ERC Starting Grant and a “BBVA Foundation Leonardo” fellowship, among other funding bodies.

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