ICFO



ICFO Colloquium Series- Catalysts: More Alive than Previously Thought

BEATRIZ ROLDAN

November 05, 2026
10:00 to 11:00
ICFO Auditorium

PROFILE:

Prof. Dr. Beatriz Roldan Cuenya studied at the University of Oviedo (Spain) and received her Ph.D. from the University of Duisburg-Essen (Germany). As a postdoc she worked at the University of California, Santa Barbara and subsequently became professor at the University of Central Florida (USA). In 2013, she accepted a Chair Faculty position in Solid State Physics at the Ruhr-Universitat Bochum (Germany). Since 2017 she has been a Director at the Fritz Haber Institute, where she heads the Department of Interface Science. She is also currently interim director of Inorganic Chemistry Department. Her main research interests are the synthesis of nanostructured materials with tunable surface properties and the experimental investigation of structure-reactivity relationships in thermal and electro-catalysis using in situ and operando methods.

ABSTRACT:
The recycling of waste products from human activities is a cornerstone of sustainable production and energy systems. In this context, the electrochemical production of basic chemical feedstocks such as ethanol, ammonia or hydrogen using green electricity plays a key role. To make such processes more active, selective and scalable, we need better catalysts than those available today. The latter requires fundamental understanding of the dynamic structure of the catalytic materials while they are performing their function.
My talk will illustrate that morphologically and chemically well-defined pre-catalysts experience drastic modifications under operation, and that such evolving nanoscale surface structure governs the activity, selectivity and kinetics of the reactions. Examples will be drawn from the study of the electrocatalytic CO2 reduction (CO2RR), electrocatalytic nitrate reduction to ammonia, and the oxygen evolution reaction (OER). The model pre-catalysts studied here will range from differently-oriented Cu single crystals to size and shape-controlled nanoparticles, epitaxial oxide thin films and single atom catalysts. The need of a synergistic multi-technique operando microscopy, spectroscopy and diffraction approach will be evidenced in order to follow the active state formation, its deactivation, or regeneration pathways. Correlations between the dynamic structure and composition of the catalysts and their activity, selectivity and durability will be featured. Moreover, special attention will be given to unveiling the role of impurities on the catalyst activation in OER, as well as of electrolyte cations in the kinetics of the formation of different active i¿½frustratedi¿½ oxy-hydroxide phases during OER or in the catalyst surface restructu ing during2RR.
Hosted by: Pelayo Garcia de Arquer