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ENGINEERING

DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

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## OPERANDO INSIGHT INTO THE ELECTROCATALYTIC CONVERSION OF CO<sub>2</sub> TO VALUABLE CHEMICALS AND FUELS



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### ABSTRACT

Tailoring the chemical reactivity of nanomaterials at the atomic level is one of the most important challenges in catalysis research. In order to achieve this elusive goal, we must first obtain a fundamental understanding of the structural and chemical properties of these complex systems. In addition, the dynamic nature of the nanostructured films and nanoparticle (NP) catalysts and their response to the environment must be taken into consideration. To address the complexity of real-world electrocatalysts, a synergistic approach taking advantage of a variety of cutting-edge experimental methods (EC-AFM, LC-TEM, XPS, XAFS, GC) has been undertaken.

This talk will provide insight into the electrocatalytic reduction of CO<sub>2</sub>. Important aspects that will be discussed are: (i) the design of size- and shape-controlled catalytically active nanoparticles (Cu, Zn, Cu-Zn) (ii) the role of the NP size and shape on the catalytic activity and selectivity, (iii) the evolution of the structure and composition of the electrocatalysts under *operando* reaction conditions and their influence on the catalytic performance, (iv) the possibility of using pulsed-electrolysis to tune the reaction selectivity. These findings are expected to open up new routes for the reutilization of CO<sub>2</sub> through its direct conversion into valuable chemicals and fuels such as ethylene and ethanol.

### BIOGRAPHY

Beatriz Roldan Cuenya is a Professor and Director of the Interface Science Department of the Fritz-Haber Institute of the Max-Planck Society in Berlin Germany since 2017. She received her PhD in solid state physics from the University of Duisburg-Essen (Germany) in 2001. She was a postdoctoral scholar at the Chemical Engineering Department of the University of California Santa Barbara (USA) from 2001-2003. She joined the University of Central Florida (USA) as an Assistant Professor of Physics in 2004, and became a full professor in 2012. From 2013-2017 she worked as Professor of Physics at the Ruhr University Bochum (Germany). Beatriz is the author of more than 140 peer-reviewed publications and 3 book chapters. She is Associate editor of ACS Catalysis and serves in the editorial board of the Journal of Catalysis, the Surface Science and the Chemical Reviews journal, and in the Advisory Committee of the Office of Basic Energy Sciences of the US Department of Energy.