MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | ITQB NOVA - Instituto de Tecnologia Química e Biológica António Xavier

RESEARCH GROUP AND URL

Organometallic Catalysis Group
https://www.itqb.unl.pt/research/chemistry/organometallic-catalysis

SUPERVISOR (NAME AND E-MAIL)

Beatriz Royo
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SHORT CV OF THE SUPERVISOR

Beatriz Royo is Principal Investigator, Group Leader of the Organometallic Catalysis Lab, and Head of the Chemistry Division at ITQB NOVA, University Nova of Lisbon. She graduated in Chemistry at University of Alcalá (Spain) and obtained her PhD degree in 1993 from the University of Sussex, UK, under the supervision of Prof. Michael F. Lappert. After four years in University of Alcalá as Assistant Professor, she moved to ITQB NOVA (Portugal) to join the group of C. Romão. In 2004, she started her independent career at ITQB NOVA as Head of the Organometallic Catalysis group. Her research spans the areas of synthetic organometallic chemistry and catalysis. Her group has developed sustainable catalytic methods for a range of organic transformations using Earth-abundant metals and N-heterocyclic carbene ligands. Her current research interests include hydrosilylation, hydrogen borrowing processes, oxidative coupling reactions and catalytic methods for the activation of CO_2 mediated by 3d metals.

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5 SELECTED PUBLICATIONS

- S. A. C. Sousa, Sara Realista, B. Royo (2020). Bench-Stable Manganese NHC Complexes for the Selective reduction of Esters to Alcohols with Silanes, *Adv. Synth. Catal*. DOI:10.1002/adsc.202000148.

- M. F. Pinto, M. Olivares, A. Vivancos, G. Guisado-Barrios, M. Albrecht, B. Royo (2019). (Di)Triazolylidene Manganese Complexes in Catalytic Oxidation of Alcohols, *Catal. Sci.Technol*. 9:2421-2425. DOI: 10.1039/c9cy00685k.

- S. A. C. Sousa, C. J. Carrasco, M. F. Pinto, B. Royo (2019). A Manganese N-Heterocyclic Carbene Catalyst for Reduction of Sulfoxides with Silanes, *ChemCatChem* 11:3839-3843. DOI: 10.1002/cctc.201900662. Selected for Cover Picture of the Special Issue *Women of Catalysis*

- F. Franco, M. F. Pinto, B. Royo, J. Lloret-Fillol (2018). Highly Active N-heterocyclic Carbene Mn(I) Electrocatalysts for CO2 Reduction, *Angew Chem Int. Ed*. 57:4603-4606. DOI: 10.1002/anie.201800705. Highlighted in ScienceDaily, RSC, on 6 March 2018, and in AzoCleanTech on 9 March 2018.

- M. F. Pinto, S. Friães, F. Franco, J. Lloret-Fillol, B. Royo (2018). Manganese N-Heterocyclic Carbene Complexes for Catalytic Reduction of Ketones with Silanes, *ChemCatChem* 10, 2734-2740. DOI: 10.1002/cctc.201800241. Selected as a Very Important Paper and Highlighted in the Cover of the journal.

PROJECT TITLE AND SHORT DESCRIPTION

Earth–abundant Metal Catalysts for CO_2 Reduction: Electro- and Photocatalytic Processes

This project tackles one of the major societal challenges of the beginning of this century: global warming. The major breakthrough of this project is the development of new catalytic systems based on Earth-abundant metals, namely manganese and iron, for the conversion of CO_2 into value added chemicals electro- and photocatalytic processes.

Nowadays, the synthesis of renewable fuels from carbon dioxide (CO_2) represents a key strategy to solve the problems of global warming and fossil fuel shortages. Inspired by nature, where plants use sunlight to transform CO_2 and H_2O into glucose and oxygen through photosynthesis, chemists are looking for the efficient conversion of CO_2 into important chemical industry feedstocks, such as CO, formic acid, and fuels like methanol and hydrocarbons (CH_4, C_2H_4). Among available approaches for valorization of CO_2, electro- and photocatalytic processes using molecular catalysts have an enormous potential to become major technologies to the production of fuels and chemicals. Interesting features of these methods are their conversion efficiencies, simplicity of the conversion procedures, and reasonable economical productions costs. Currently, the most common catalysts for electro- and photo-catalytic conversion of CO_2 are primarily based on expensive and toxic metal complexes. Global supplies of many precious metals are predicted to reach critical levels in the next 10 to 20 years. Therefore, there is a real need to replace the use of noble metals by Earth-abundant 3d transition metals. Despite recent advances of molecular catalysts with 3d metals, development of robust homogeneous electro- and photocatalysts remains a challenge, as most exhibit low turnover numbers (TONs) and poor selectivity.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Chemistry (CHE)