

<b>Title</b>	<b>First-row transition metal complexes with N-heterocyclic carbene (NHC) ligands as homogeneous catalysts in the chemical valorization of CO<sub>2</sub></b>
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**Project description:**

The PhD project will be focused on the synthesis novel **organometallic complexes** with **N-heterocyclic carbene (NHC) ligands** and **first-row transition metals**. The chemistry of 3d organometallic complexes has been overlooked in the last years, due to preconceived notions on their poor stability.[1] The greater availability of non-noble metals, and the different reactivity that this class of compounds shows in particular in redox processes compared to 4d and 5d metals complexes, are shifting the interest of many researchers on this field.[2] We use organometallic complexes in **homogeneous catalysis** in **CO<sub>2</sub> chemical valorization reactions**. Carbon dioxide is the most abundant greenhouse gas present in the atmosphere, and its high concentration is mainly due to anthropogenic emissions related to energy production from fossil fuel combustion. The development of **CO<sub>2</sub> conversion technologies** is therefore strategic in fighting the global warming and **climate change**.[3] Through homogeneous catalysis it is possible to use **CO<sub>2</sub> as C1 feedstock** to produce added value molecules, such as organic carbonates, methyl amines, formamides and carboxylic acids.[4]



[1] G. G. Zámbo, J. F. Schlagintweit, R. M. Reich, F. E. Kühn, *Catal. Sci. Technol.*, **2022**, *12*, 4940-4961.

[2] M. Albrecht, R. Bedford, B. Plietker, *Organometallics*, **2014**, *33*, 5619–5621.

[3] J. Zhang, C. D. Sewell, H. Huang, Z. Lin, *Adv. Energy Mater.*, **2021**, *11*, 2102767.

[4] N. A. Tappe, R. M. Reich, V. D'Elia, F. E. Kühn, *Dalton Trans.*, **2018**, *47*, 13281-13313.

**Recent Publications:**

- G. Meloni, L. Beghetto, M. Baron, A. Biffis, P. Sgarbossa, M. Mba, P. Centomo, L. Orian, C. Graiff, C. Tubaro, *Mol. Catal.*, **2023**, *538*, 113006.
- A. Conte, M. Baron, S. Bonacchi, S. Antonello, A. Aliprandi, *Nanoscale*, **2023**, *15*, 3693-3703.

**Hosting group(s) for the period abroad (tentative list, may change):**

Prof. Alexander Pöthig. / Technical University of Munich / Garching bei München (Germany).