"Sustainable reduction of carboxylic acid derivatives applying non-noble metal based catalysts"

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The cost-effective and waste-free synthesis of materials, life science goods and all kinds of organic products require efficient chemical transformations. In this regard, development of more active and selective catalysts constitutes a key factor for achieving improved processes and providing the basis for a sustainable chemical industry. Despite continuous advancements in all areas of catalysis, still organic syntheses as well as the industrial production of most chemicals can be improved significantly in terms of sustainability and efficiency.

In the talk, it will be shown how new and improved homogeneous non-noble metal-based catalysts can be developed. Specifically, the phenomenon of cooperative catalysis will be addressed in the context of non-noble metal-pincer type catalysts for the reduction of carboxylic acid derivatives (ester, nitriles, amides) as well as heterocyclic compounds.[1] In detail, it will be demonstrated that recently developed molecular-defined cobalt, manganese, molybdenum, and iron catalysts enable catalytic hydrogenation processes with high yields and unprecedented selectivity. Especially, the influence of different substitution patterns at the phosphorous binding site as well as at the metal site on the catalytic performance of these pincer complexes is presented.[2]

In addition, the principle of cooperative catalysis will be shown in the context of modern phosphorous-free catalysts for oxidation reactions.[3] By rational design novel ligands and complexes have been synthesized, which allow for unprecedented efficiency in such transformations.

Examples which demonstrate the potential of such catalytic processes with bio-relevant metal complexes are compared to more traditional catalytic reactions. In this respect, also the development of nano-structured non-noble metal catalysts is included.[4]

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[3] D. Verspeek, S. Ahrens, X. Wen, Y. Yang, Y.-W. Li, K. Junge, M. Beller, *Cat. Sci. Technol.* **2022**, *12*, 7341-7348.
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