MODULAR PINCER CATALYSTS FOR CO_2 HYDROGENATION

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Burning fossil fuels worldwide has led to an increasing CO_2 concentration in the atmosphere to such a large extent that global climate change caused by greenhouse gases has become a major ecological challenge.

The catalytic conversion of $CO_2/H_2/CO$ to methanol is already being performed on an industrial scale. Other products, such as formic acid, formic acid derivatives, formaldehyde, and carbon monoxide can be, in principle, synthesized by carbon dioxide hydrogenation. However, despite this progress, we are still far from the point where carbon dioxide becomes a concrete player in the sustainable chemistry/energy market.

The talk is devoted to designing ligand-metal cooperative catalytic systems for the hydrogenation of CO_2. Our studies revolve around a family of 3-dimensional PC(sp^3)P pincer complexes based on the dibenzobarrelene scaffold developed by our group. The synthetic approach leading to all these examples is straightforward and represents a modular and divergent approach to a variety of 3-dimensional platforms equipped with custom-tailored primary and secondary coordination spheres. In particular, we address the cooperative activation and functionalization of carbon dioxide by bifunctional catalysts possessing transition metals (M) in the primary coordination sphere and a pendant Lewis acidic functionality (LA) in the secondary sphere.[1-4]

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[1] Gelman D. et al. (2024) ACS Catal. 14:13163-13173.

[2] Gelman D. et al. (2024) ACS Catal. 14:1629-1638.

[3] Gelman D. et al. (2023) Chem. Eur. J. e202301915.

[4] Gelman D. et al. (2011) Angew. Chem., Int. Ed. 50: 3533-3537.