Hybrid Ligands for Metal Complexes, Catalysts and Nanomaterials

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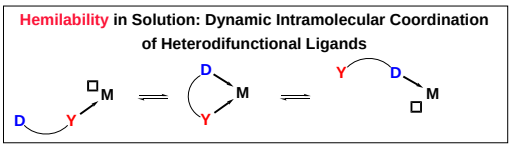
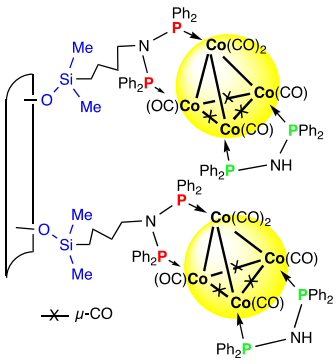
The growing interest for the structural, catalytic and physical properties of coordination/organometallic metal complexes is triggered by their wide range applications. Very diverse hybrid ligands, characterized by chemically different donor groups, have been developed to allow a better control of the metal coordination sphere and their potential ability to undergo dynamic behaviour, or hemilability, is directly relevant to key steps in industrially relevant processes in homogeneous catalysis.[1]



Examples will focus on the activation of CO_2 and if time allows, the catalytic oligomerisation of ethylene using short-bite and/or *N*-heterocyclic carbene (NHC) ligands.[2,3]



Stepwise approaches allow the anchoring of molecules in mesoporous materials, allowing the subsequent controlled generation of catalytically active mixed-metal nanoparticles.[4]

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1. See e.g. a) P. Braunstein, F. Naud, *Angew. Chem. Int. Ed*. **2001**, *40*, 680; b) W.-H. Zhang, S. W. Chien, T. S. A. Hor, *Coord. Chem. Rev*. **2011**, *255*, 1991.
2. See e.g. C. Fliedel, A. Ghisolfi, P. Braunstein, *Chem. Rev*. **2016**, *116*, 9237.
3. For reviews on metal complexes with N-Heterocyclic Carbenes (NHC) ligands, see e.g. S. Hameury, P. de Frémont, P. Braunstein, *Chem. Soc. Rev.* **2017**, 46, 632; V. Charra, P. de Frémont, P. Braunstein, *Coord. Chem. Rev*. **2017**, *341*, 53; A. A. Danopoulos, T. Simler, P. Braunstein, *Chem. Rev.* **2019**, *119*, 3730-3961.
4. For a general review on heterometallic complexes and clusters in catalysis, see: P. Buchwalter, J. Rosé, P. Braunstein, *Chem. Rev*. **2015**, *115*, 28-126.