



Reductive Functionalization of CO₂ Using Molecular Catalysts

Thibault Cantat

► To cite this version:

Thibault Cantat. Reductive Functionalization of CO₂ Using Molecular Catalysts. Zing Conferences "Carbon Dioxide Catalysis", Apr 2016, Albufeira, Portugal. cea-02351446

HAL Id: cea-02351446

<https://cea.hal.science/cea-02351446>

Submitted on 6 Nov 2019

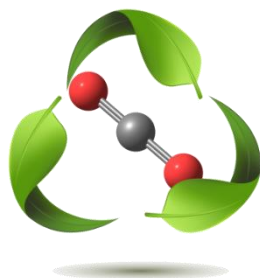
HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Reductive Functionalization of CO₂ Using Molecular Catalysts

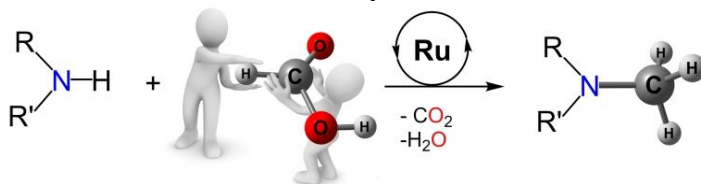
Thibault Cantat*

NIMBE, CEA, CNRS, Université Paris-Saclay, Gif-sur-Yvette, France.



While greenhouse gases emissions are reaching alarming levels, fossil fuels still represent 80% of the world energy portfolio and 95% of our chemical commodities rely on non-renewable resources, namely hydrocarbons. In this context, utilizing CO₂ as a C₁ building block to produce platform chemicals as an alternative to petrochemistry has a double advantage of reusing CO₂ while sparing fossil resources and avoiding CO₂ emissions from their use. We have developed a strategy relying on the simultaneous use of a functionalizing reagent and a reductant that can be *independently* adjusted to perform the reductive functionalization of CO₂. The so-called *diagonal approach* will be discussed and exemplified with novel catalytic

processes to convert CO₂ to formamides, N-heterocycles, methylamines and methanol, using hydroboranes, hydrosilanes or formic acid as reductants. These new catalytic reactions rely on the use of simple organocatalysts or Zn, Fe and Ru organometallic complexes. The mechanisms at play in these transformations will be presented, based on DFT calculations and isolation of reactive catalytic intermediates.¹⁻⁹



References

1. Gomes, C. D.; Jacquet, O.; Villiers, C.; Thuery, P.; Ephritikhine, M.; Cantat, T. *Angew. Chem. Int. Ed.* **2012**, *51*, 187-190.
2. Jacquet, O.; Gomes, C. D.; Ephritikhine, M.; Cantat, T. *J. Am. Chem. Soc.* **2012**, *134*, 2934-2937.
3. Jacquet, O.; Frogneux, X.; Gomes, C. D.; Cantat, T. *Chem Sci*, **2013**, *4*, 2127-2131.
4. Pouessel, J.; Jacquet, O.; Cantat, T. *ChemCatChem*, **2013**, *5*, 3552-3556.
5. Jacquet, O.; Gomes, C. D.; Ephritikhine, M.; Cantat, T. *ChemCatChem*, **2013**, *5*, 117-122.
6. S. Savourey, G. Lefèvre, J.-C. Berthet, P. Thuéry, C. Genre, T. Cantat, *Angew. Chem. Int. Ed.* **2014**, *53*, 10466-10470.
7. E. Blondiaux, J. Pouessel, T. Cantat, *Angew. Chem. Int. Ed.* **2014**, *53*, 12186-12190.
8. Chauvier, C.; Tilili, A.; Gomes, C. D.; Thuéry, P.; Cantat, T. *Chem Sci*, **2015**, *6*, 2938-2942.
9. Cantat T. *et al.*, Patent applications n° WO 2012/137152, PCT/IB2013/054601, PCT/IB2013/054599, FR1259757, FR1352996.