

# Activation and Conversion of CO<sub>2</sub> and SO<sub>2</sub> under Metal-Cree Conditions

T. Cantat

► **To cite this version:**

T. Cantat. Activation and Conversion of CO<sub>2</sub> and SO<sub>2</sub> under Metal-Cree Conditions. ESOC 2017, Jul 2017, Cologne, Germany. cea-02341645

**HAL Id: cea-02341645**

**<https://hal-cea.archives-ouvertes.fr/cea-02341645>**

Submitted on 31 Oct 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.

# Activation and Conversion of CO<sub>2</sub> and SO<sub>2</sub> under Metal-free Conditions

T. Cantat

NIMBE, CEA, CNRS, Université Paris-Saclay, 91191 Gif-sur-Yvette, France  
e-mail: thibault.cantat@cea.fr

With 95 % of organic chemical commodities deriving from fossil resources, the chemical industry is currently exploring novel and renewable carbon feedstocks for the production of both bulk and fine chemicals.<sup>1</sup> In this context, the utilization of CO<sub>2</sub> or products derived from biomass wastes is an attractive strategy to access value-added products. Because these carbon sources feature carbon atoms in an oxidized state, the development of reduction methods is needed and they call for the design of efficient catalysts able to break strong C-O and C=O bonds.

Over the last years, our group has developed novel catalytic reactions for the conversion of CO<sub>2</sub> to formamides, N-heterocycles, methylamines and methanol, using hydroboranes, hydrosilanes or formic acid as reductants.<sup>2-16</sup> Extension of this methodology to SO<sub>2</sub> enabled the facile conversion of this gaz to sulfones, under metal-free conditions.<sup>17</sup> These new catalytic transformations rely on the use of simple organocatalysts, including nitrogen and phosphorus bases as well as Frustrated Lewis Pairs. The mechanisms at play in these transformations will be presented, based on DFT calculations and isolation of reactive catalytic intermediates.

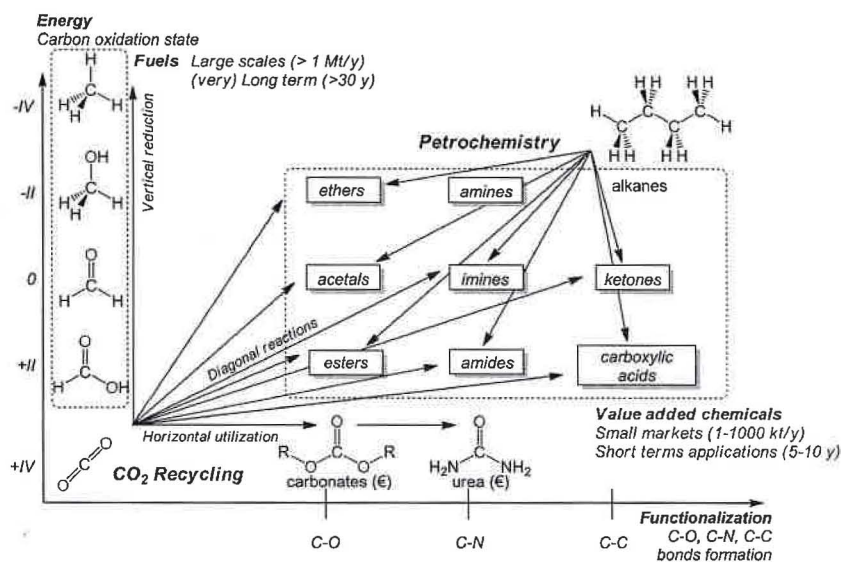


Figure 1. A diagonal approach to the chemical recycling of CO<sub>2</sub>.

## References

1. C. Chauvier, T. Cantat, *ACS Catalysis* **2017**, *7*, 2107-2115.
2. C. D. Gomes, O. Jacquet, C. Villiers, P. Thuery, M. Ephritikhine, T. Cantat, *Angewandte Chemie-International Edition* **2012**, *51*, 187-190.
3. O. Jacquet, X. Frogneux, C. D. Gomes, T. Cantat, *Chemical Science* **2013**, *4*, 2127-2131.
4. O. Jacquet, C. D. Gomes, M. Ephritikhine, T. Cantat, *Chemcatchem* **2013**, *5*, 117-120.
5. X. Frogneux, O. Jacquet, T. Cantat, *Catalysis Science & Technology* **2014**, *4*, 1529-1533.
6. C. D. Gomes, E. Blondiaux, P. Thuery, T. Cantat, *Chemistry-a European Journal* **2014**, *20*, 7098-7106.
7. A. Tlili, X. Frogneux, E. Blondiaux, T. Cantat, *Angewandte Chemie-International Edition* **2014**, *53*, 2543-2545.
8. C. Chauvier, A. Tlili, C. D. Gomes, P. Thuery, T. Cantat, *Chemical Science* **2015**, *6*, 2938-2942.
9. X. Frogneux, E. Blondiaux, P. Thuery, T. Cantat, *ACS Catalysis* **2015**, *5*, 3983-3987.
10. A. Tlili, E. Blondiaux, X. Frogneux, T. Cantat, *Green Chemistry* **2015**, *17*, 157-168.
11. A. Aloisi, J. C. Berthet, C. Genre, P. Thuery, T. Cantat, *Dalton Transactions* **2016**, *45*, 14774-14788.
12. X. Frogneux, N. von Wolff, P. Thuery, G. Lefevre, T. Cantat, *Chemistry-a European Journal* **2016**, *22*, 2930-2934.
13. C. Lescot, S. Savourey, P. Thuery, G. Lefevre, J. C. Berthet, T. Cantat, *Comptes Rendus Chimie* **2016**, *19*, 57-70.
14. A. Tlili, A. Voituriez, A. Marinetti, P. Thuery, T. Cantat, *Chem. Commun.* **2016**, *52*, 7553-7555.
15. N. von Wolff, G. Lefevre, J. C. Berthet, P. Thuery, T. Cantat, *ACS Catalysis* **2016**, *6*, 4526-4535.
16. N. von Wolff, C. Villiers, P. Thuery, G. Lefevre, M. Ephritikhine, T. Cantat, *Eur. J. Org. Chem.* **2017**, *2017*, 676-686.
17. N. von Wolff, J. Char, X. Frogneux, T. Cantat, *Angewandte Chemie-International Edition* **2017**, DOI: 10.1002/anie.201702311.