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► **To cite this version:**

Thibault Cantat. Catalytic strategies for the reduction of C-O bonds in CO₂. Innovative Catalysis and Sustainability (ICS 2019), Jan 2019, Bardonecchia, Italy. cea-02329464

HAL Id: cea-02329464

<https://cea.hal.science/cea-02329464>

Submitted on 23 Oct 2019

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Catalytic strategies for the reduction of C-O bonds in CO₂

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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.[1] In this context, the utilization of CO₂ 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.

The presentation will focus on describing how the capture and utilization of CO₂ (CCU) can help deliver efficient services in an energy system, which features an increasing portion of renewable energies. The challenges and opportunities underpinning the transformation of CO₂ to fine and bulk chemicals will be identified. Recent advances in the field will be discussed and exemplified with recent novel transformations enabling the use of CO₂ as a C₁-building block for the formation of amines, amides, esters, etc. [2,3]

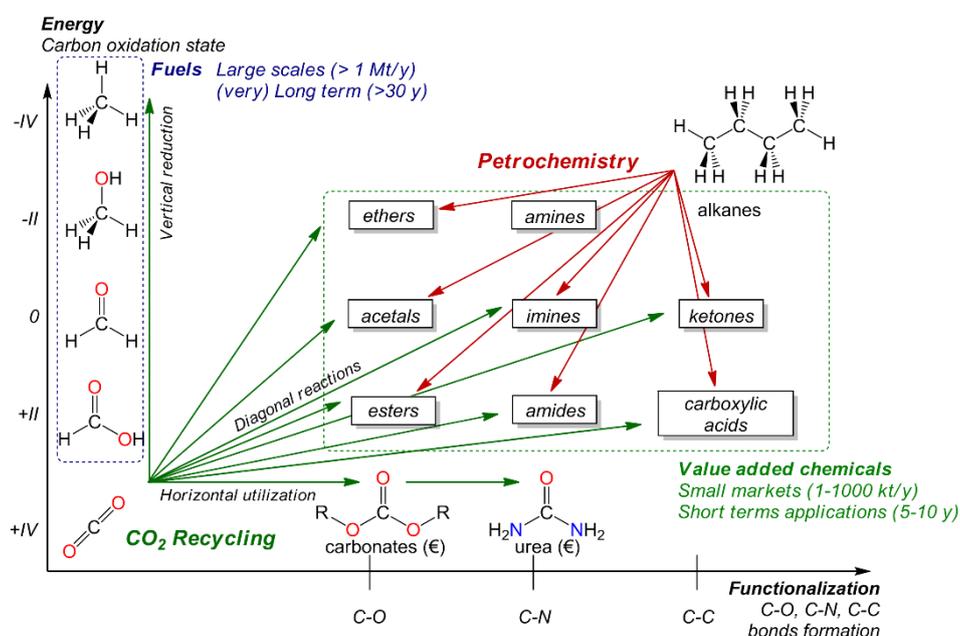


Figure 1. A diagonal approach to the chemical transformation of CO₂

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, *Angew. Chem. Int. Ed.* (2012), 51, 187-190.
- [3] A. Tlili, E. Blondiaux, X. Frogneux, T. Cantat, *Green Chemistry* (2015), 17, 157-168.

Selected Readings

- <https://www.sapea.info/ccu/> : The report, commissioned by the EU, on CCU from the Science Advice for Policies by the European Academies (SAPEA).
- P. Lanzafame, S. Abate, C. Ampelli, C. Genovese, R. Passalacqua, G. Centi, S. Perathoner, *ChemSusChem* (2017), 10, 4409-4419 : a recent and timely review on the possibilities offered by an energy system powered by renewable energies in the chemical industry.