

# CO<sub>2</sub> conversion using organometallic and organic molecular catalysts

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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 CO<sub>2</sub> as a C1 building block to produce platform chemicals as an alternative to petrochemistry has a double advantage of reusing CO<sub>2</sub> while sparing fossil resources and avoiding CO<sub>2</sub> 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 CO<sub>2</sub>. The so-called diagonal approach will be discussed and exemplified with novel catalytic processes to convert CO<sub>2</sub> to formamides, N-heterocycles, methylamines and methanol, using hydroboranes, hydrosilanes or formic acid as reductants.

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Thibault CANTAT studied chemistry at the École Normale Supérieure in Paris, where he worked in the group of Prof. Christian Amatore and Dr. Anny Jutand on studying the mechanism of palladium-catalyzed allylation reactions. He obtained his Ph.D. in Chemistry in 2007, under the supervision of Dr. Nicolas Mézailles and Prof. Pascal Le Floch, at the Ecole Polytechnique, France. Using synergy between theory and experiments, Cantat's work focused on establishing new routes to carbene complexes for transition metals and lanthanides, using stable geminal dianions and carbenoides. From 2007, he became interested in the unique chemical behaviors of the early actinides and he held a joint Director's Postdoctoral position at Los Alamos National Laboratory (USA) in the groups of Dr. Jaqueline Kiplinger (experiments) and Dr. P. Jeffrey Hay (theory). He came back to France in 2009 where he started a research group focused on the activation and recycling of CO<sub>2</sub>, at CEA Saclay. He was awarded with the Grand Prix Scientifique of the Louis D. Foundation by the Institut de France (2013) and was granted a Starting Grant by the ERC in 2013.



### Research interests:

The general topic of his research is the development of novel catalytic reactions for the efficient reduction of CO<sub>2</sub> and biomass. His research interests therefore span organometallic chemistry of the transition metals and the *f*-elements to homogenous catalysis and computational chemistry.