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T. Cantat

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Catalytic Strategies for the Reductive Functionalization of CO₂

T.Cantat*

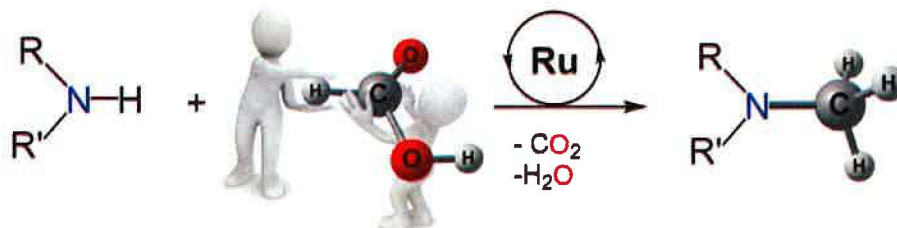
NIMBE, CEA, CNRS, Université Paris-Saclay,

CEA Saclay 91191 Gif-sur-Yvette, France

e-mail: thibault.cantat@cea.fr



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]



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