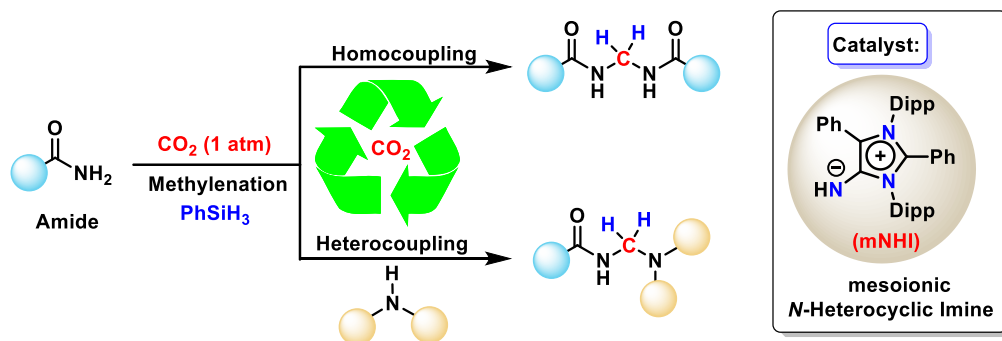


Discovering New Reaction with CO₂

By Arpan Das



Carbon dioxide (CO₂) is one of the major greenhouse gases in the atmosphere and the emission of CO₂ is increasing every year. The rising levels of atmospheric CO₂ have caused an increase in global temperatures. To tackle this Global issue, we aim at reaching NET Zero emission of CO₂, however, this requires a combined approach such as carbon capture and storage (CCS) and carbon capture and utilization (CCU). At present, we do not have any sustainable technology that can lead to NET ZERO emission. For example, with our current technology even we can achieve CCU with its best efficiency, it cannot consume more than 10% of total emitted CO₂. Thus, it requires discovery of new CO₂ utilization methods. However, activation and catalytic transformation of CO₂ has been thermodynamically challenging which often requires the use of transition metal-based catalyst. It is even more difficult when one wishes to accomplish without using a transition metal-based catalyst. Recently we discovered a new reaction with CO₂, where we utilized CO₂ as a coupling reagent to stitch two inert primary amide molecules under completely metal-free condition. In this work, we have synthesized a series of super nucleophilic mesoionic *N*-Heterocyclic Imines (mNHI). These were found to be highly capable toward the capture of CO₂ under ambient conditions. This super nucleophilicity of mNHI was utilized in the activation of two inert molecules amides and CO₂ to devise a strategy for the activation and catalytic reduction of CO₂ to methylene compounds through the coupling of amides and amines. In this process we developed two hitherto unknown reaction directly from CO₂.



Refs: **A. Das**, P. Sarkar, S. Maji, S. K. Pati and S. K. Mandal, “Mesoionic *N*-Heterocyclic Imines as Super Nucleophiles in Catalytic Coupling of Amides by CO₂.” *Angew. Chem. Int. Ed.*, **2022**, 10.1002/anie.202213614.