Exploration of New Molecular Catalysis and Reactivity

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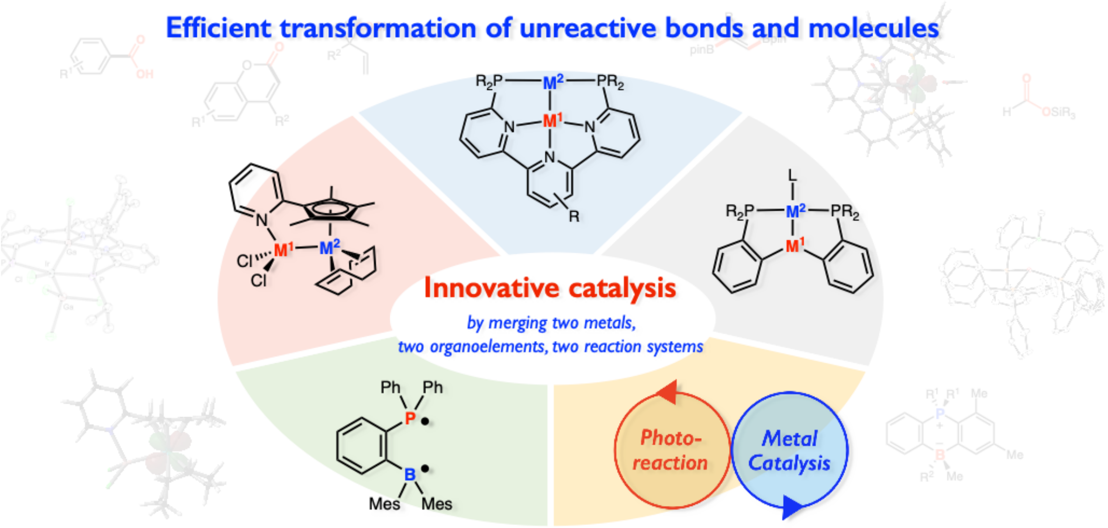
Creation of innovative catalysts and reactive species that enable efficient transformation of unreactive bonds and molecules has been a formidable challenge in synthetic chemistry and catalysis science. We have been working on design, synthesis, and utilization of heterobimetallic transition metal catalysts having metal-metal bonds supported by precisely designed organic scaffolds, which enable efficient transformation of carbon dioxide and other organic molecules.[1] One of successful examples was demonstrated in hydrosilylation of carbon dioxide, where an Al–Pd bimetallic complex exhibited the highest catalytic activity ever reported.[2] We also achieved an unprecedented C–C σ-bond cleavage reaction of ambiphilic phosphine-borane compounds under photoirradiation conditions enabled by transiently generated excited Frustrated Lewis Pairs.[3,4] Furthermore, we have demonstrated that the new cooperative catalysis merging photochemistry and transition metal catalysis enables unprecedented C–C σ-bond cleavage and functionalization of arylketones.[5] In this presentation, recent progresses on these chemistry focusing on transformation of carbon dioxide and unreactive C–C σ-bonds will be discussed.



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