A2-10 Cooperative Catalysis for Transformations of Unreactive Bonds and Molecules

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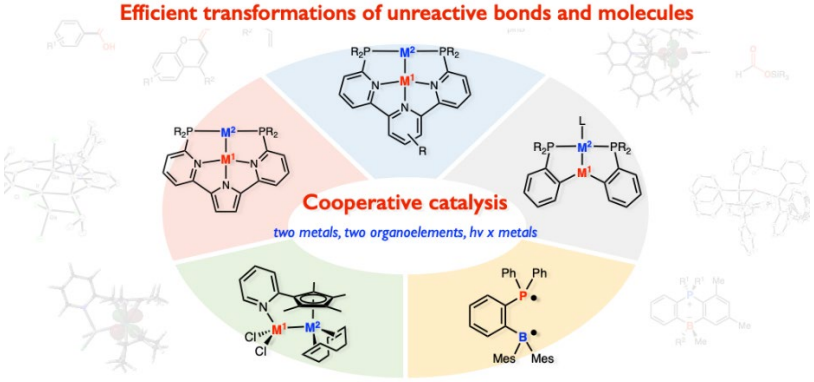
Creation of innovative catalysts and reactive species that enable efficient transformation of unreactive bonds and molecules has been a formidable challenge in synthetic chemistry and catalysis science. We have been studying on cooperation between two metals, two organoelements, and two reaction factors to realize unique catalysis and reactivity, which enable unprecedented molecular transformations. 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.[1a)] We also achieved an unprecedented C–C σ-bond cleavage reaction of umbiphilic phosphine-borane compounds under photoirradiation conditions enabled by transiently generated excited Frustrated Lewis Pairs.[2)] In this presentation, recent progresses on these chemistry and development of new cooperative catalysis merging photochemistry and transition metal catalysis will be discussed.



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PROFILE

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Dr. Jun Takaya received his PhD from Tokyo Institute of Technology under the direction of Prof. Nobuharu Iwasawa (2004). After a JSPS postdoctoral period (2004-05) with Prof. John F. Hartwig at Yale University, he was appointed to an Assistant Professor of the research group of Prof. Nobuharu Iwasawa at Tokyo Institute of Technology in 2005, and promoted to Associate Professor in 2014. He was working as a JST PRESTO researcher in the project of Science and Creation of Innovative Catalysts from 2017 to 2020. He received Incentive Award in Synthetic Organic Chemistry, Japan in 2013, Merck-Banyu Lectureship Award in 2014, Thieme Chemistry Journal Award 2015, The Young Scientist's Prize in 2016, and Asian Core Program Lectureship Award (China, Korea) in 2019. His research interests are in the development of new transition metal catalysts, reactive species, and reaction systems to achieve new molecular transformations in synthetic chemistry.