

Small-Molecule Activation Driven by Metal-Metal Cooperation in Pt/Base Metal Complexes

(¹Coordination Chemistry and Catalysis Unit, Okinawa Institute of Science and Technology Graduate University, ²Arbuzov Institute of Organic and Physical Chemistry, FCR Kazan Scientific Center, Russian Academy of Sciences, ³Department of Chemistry and Biotechnology, Graduate School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan) ○ Govindarajan Ramadoss,¹ Shubham Deolka,¹ Eugene Khaskin,¹ Robert R. Fayzullin,² Shrinwantu Pal,³ Julia R. Khusnutdinova*¹

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The design and exploration of a multimetallic complex has gained much interest owing to their great potential in catalysis and small molecule activation via cooperation of two or more metal centers. In particular, heterobimetallic complexes play a crucial role in small molecule activation since two different metal centers in proximity may allow facile activation of small and inert molecules.¹ However, the synthesis of selective heterobimetallic complexes is highly challenging due to unselective binding of two metal ions by the ligand core; in many cases scrambling of metal ions can occur. To overcome this synthetic difficulty our group has recently started working on the synthesis of unsymmetrical ligand scaffolds by functionalizing naphthyridine core at 2 and 7 positions, where one of the side arms has a soft phosphine donor and the opposite arm has a hard nitrogen donor. Such a ligand design allowed us to form selective heterobimetallic complex via stepwise synthesis. As a result, we previously reported metal-metal cooperative B-C and C-H bond activation by Pt/Cu heterobimetallic complexes,² Herein, we report the selective stepwise synthesis of heterobimetallic complexes where Pt showing close interaction with other non-transition, base metals in unsymmetrical 1,8-naphthyridine ligand core. This talk will cover the aspects about metal-metal cooperation and how the potential synergistic interaction between Pt and a base metal influence the reactivity towards H₂, Si-H, B-H and C-H activation of alkynes, while such reactivity is not observed when Pt alone or base metal alone are present. The presence of Pt-base metal interaction will be analyzed by QTAIM and NBO analyses.



- 1) A. N. Desnoyer, A. Nicolay, P. Rios, M. S. Ziegler, T. D. Tilley, *Acc. Chem. Res.* **2020**, *53*, 1944.
- 2) S. Deolka, O. Rivada, S. L. Aristizábal, R. R. Fayzullin, S. Pal, K. Nozaki, E. Khaskin, J. R. Khusnutdinova, *Chem.Sci.* **2020**, *11*, 5494.