

Report for the Overseas Dispatch

Department of Chemistry and Biotechnology

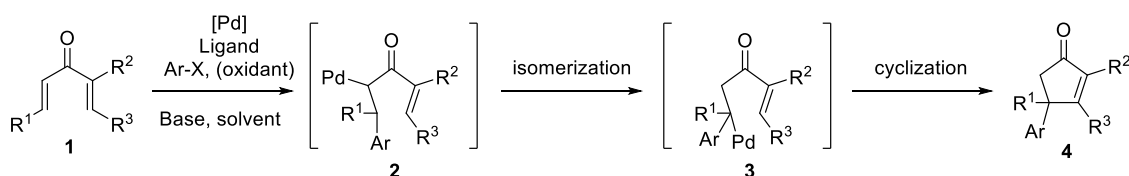
Nozaki Group

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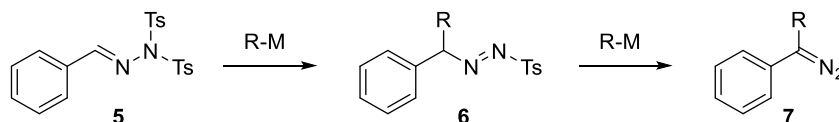
Place: University of Hawaii at Manoa, Tius Group

Term: 3-13-2016 to 5-22-2016

• Research



Scheme 1. Palladium-catalyzed asymmetric pseudo-Nazarov cyclization.



Scheme 2. Synthesis of diazo compounds from the reaction of bistosylhydrazone and organometals.

I worked on two projects under the guidance of Prof. Tius during the overseas dispatch. One is “Palladium-catalyzed asymmetric pseudo-Nazarov cyclization” (Scheme 1) that I proposed and the other is “Synthesis of diazo compounds from the reaction of bistosylhydrazone and organometals.” (Scheme 2) that is proposed by Tius.

Nazarov cyclization is a well-known reaction utilized for the construction of cyclopentenone structure. Despite of its importance, it suffers from some limitations. For instance, functional groups susceptible to acidic condition are not tolerant because the use of very strong brønsted acid or lewis acid is often necessary. Also, it is difficult to control the stereoselectivity of the reaction, and synthesis of multi-substituted dialkenyl ketones is needed prior to the construction of a desired cyclopentenone structure. In this context, I proposed the palladium-catalyzed asymmetric pseudo-Nazarov cyclization which potentially enable the construction of multi-substituted cyclopentenone structures from less-substituted dialkenyl ketones in an asymmetric fashion under a mild condition. Tius is an expert of metal-catalyzed asymmetric Nazarov cyclization and thus I started this investigation as shown in scheme 1. I chose bidentate molecules like PyOX type molecules, bipyridine, and phenanthroline as ligands.

Dibenzylideneacetone (dba) was selected as a substrate. Although I screened several reaction conditions, the desired reaction did not proceed. This is probably due to the dissociation of ligands during catalysis caused by the presence of a large amount of dba in the reaction system. I suspended this project at this stage and started to work on the second project due to the time limitation.

Tius group is nowadays working on the development of Nazarov type reaction catalyzed by gold complexes. The first step of this reaction is a transfer of carbene to gold and thus my project is a development of a new method for the synthesis of diazo compounds that is a precursor of carbene. First, I examined the synthesis of **5** which is an unknown compound. After several trials, I successfully synthesized **5** in ca. 50% yield. Next, I examined the synthesis of **6**. I tried various reaction conditions and found that **6** was produced in ca. 10% yield. Although I could not succeed in the synthesis of **7**, I could synthesize **5** and **6**. This progress would give an insight into the future development of this chemistry.

• Life in Hawaii

Since this was my first time to stay at foreign countries for over one week, my overseas dispatch was very exciting. Especially, it was almost first time to discuss chemistry in English in foreign country where there is no Japanese. Sometimes my poor English skill irritated me, but the fact that I could communicate with people in English than expected made me feel happy.



Kahala beach

Another interesting thing is the life with housemate. As I had never experienced the house-sharing, I was a bit nervous before starting new life. Gratifyingly, I could live with housemates quite comfortably mainly owing to a great kindness of Kai Iida who is a Japanese housemate. Every housemate was very friendly and I sometimes enjoyed BBQ with them. I also enjoyed walking around various beautiful beaches and shopping to refresh myself on holydays.

• Acknowledgement

I would like to express my appreciation to Prof. Marcus, A. Tius, who supported me in terms of research and the life in Hawaii. I also would like to show my gratitude toward Prof. Kyoko Nozaki and Makoto Fujita who helped me prepare for the visiting. Finally, I would like to thank MERIT program for providing me a great opportunity to study abroad and a financial support.