MERIT Long-term Overseas Dispatch

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Laboratory: Prof. Jeremiah A. Johnson

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Introduction

I stayed at Prof. Jeremiah A Johnson's Lab in Massachusetts Institute of Technology (MIT) for three months, and conducted my project there. Before getting his current position in MIT, Prof. Johnson worked with Prof. Robert H. Grubbs (Caltech, Nobel laureate 2005) as a Post-doc, where he studied polymerization by using Grubbs catalysts. Although he is still young, after becoming a PI, he has been publishing many papers to high journals such as *JACS*, *Nature Sisters* and *Science*. I chose this lab because I would like to study polymer chemistry, and to work with a young talented PI. In fact, polymer chemistry is totally different from my research in Japan, but I was able to study well and to have an exciting life there for three months.

Research Project in MIT

Many of research projects at Johnson's Lab are based on polymers synthesized by ROMP (Ring Opening Metathesis Polymerization) with Grubbs catalysts. Because I only took polymer chemistry classes when I was a bachelor student, and had almost no experience of synthesizing polymers, entering Johnson's Lab was a kind of incautious challenge. Prof. Johnson kindly gave me a co-worker, who is a 4th year of graduate student, in order for me to proceed research smoothly. As he has been investigating bulk-state assembly of bottlebrush copolymers, collaboration with him was supposed to be very nice to exploit my knowledge. However, I considered well what kind of experience would be obtained from this collaboration at Johnson's Lab, because I thought that bulk-state assembly of bottlebrush polymers was similar to thermotropic liquid crystals, which is one of my projects in Japan, and that possibly this collaboration would end up with just a help of synthesis. Finally, I tried to propose a three-month project to Prof. Johnson.

I took account of two points for setting up my own project: (1) I could study the basic of bottlebrush polymers. (2) Even if the project is small, I could summarize it in a story. With these points in mind, I proposed my project titled by "Synthesis of Miktobrush-arm Star Polymers via Brush-First Method". The

"brush-first" method was for the first time developed at Johnson's Lab to synthesize star polymers. Prof. Johnson kindly accepted my proposal and allowed me to use organic compounds synthesized by other members previously to proceed the project smoothly. Because I shared some compounds with other members, I did not have to use much time for synthesis. In fact, I needed to discuss with many people to conduct new experiments of which no one has experiences because my project was totally independent from other members, but this was quite a nice experience for me. Perhaps, some members might wonder what Yoshiki was trying to do by uncommon methods. I strongly recommend that those who have a chance to go overseas for research should try to have an independent project even though you will stay short.

Preparation of Studying Abroad & Lab Life

This was my first time to stay overseas for long period. I had a lot of trouble in some procedures such as getting my J-1 visa or finding an apartment in America. I was quite surprised that not all of those who would like to study overseas are allowed to stay in MIT, because we need to prove our balance in account or to get some fellowship to pay the tuition fee.

Generally, researchers in organic chemistry lab in Japan work too hard. Likewise, most of the members in Johnson's Lab work so hard. They come to the lab relatively early at around 9 am, and stay until 8 or 9 pm. If needed, they often come to the lab on weekend. However, one thing I learned there was that they conducted necessary experiments efficiently because they had their own private time and schedule.

Final Remarks

I would not be able to finish up my project without a lot of help and advice from my colleagues in Johnson's Lab. Also, Prof. Johnson kindly made several times for me to have discussions while he was very busy. I really express my gratitude to all members in Johnson's Lab.

I also would like to thank MERIT program that supported my visit for three months, and my supervisor Prof. Takuzo Aida, who kindly allowed me to study overseas. I was able to have a great and unrepeatable experience.