

# MERIT Internship Report

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## I. Overview

Host: Coordination Chemistry and Catalysis Unit, Okinawa Institute of Science and Technology

(Prof. Julia Khusnutdinova)

Period: 2021/09/27–2021/12/10

Research Topic: Development of hydrogenation reactions using first-row transition metal complexes

## II. Motivation

Okinawa Institute of Science and Technology Graduate University (OIST) is an institute with researchers in diverse fields such as materials science, biology, marine science, and environment and ecology. Dr. Julia Khusnutdinova, who heads the Coordination Chemistry and Catalysis Unit here, has reported catalytic reactions using various metal complexes with unique ligands. I applied for the internship at OIST for the following three reasons, as well as I have been interested in their research after listening to a presentation by the Khusnutdinova group at an academic conference:

1) To get away from my familiar environment and challenge new chemistry: I wanted to challenge myself in a different field of chemistry, and see if the knowledge and experimental techniques I had developed so far would work. In addition, I wanted to learn how to handle compounds in an inert atmosphere (glove box, Schlenk technique, etc.), which is one of the strengths of the Khusnutdinova Group, to apply tips to my research in Tokyo.

2) To be in an international environment: 60% of the faculty and 80% of the students at OIST are from overseas, making it a unique multinational environment. As I have never been abroad before, OIST appealed to me because it provided me with opportunities to communicate in English and understand different backgrounds.

3) Being interested in OIST itself: OIST is established to contribute to the promotion of the Okinawa area and the development of science and technology and has a generous budget and research environment with special financial support from the government. I was interested in Japan's science and technology policy through my graduate school life, so I wanted to see the research environment at OIST with my own eyes and think about the issues and ideal state of Japanese universities and research institutions.

## III. Research

I worked on the development of catalytic hydrogenation reactions using first-row transition metal complexes with pincer-type ligands developed by the Khusnutdinova group. Specifically, I synthesized metal complexes, optimized catalytic reaction conditions, experimentally elucidated the reaction mechanism, and explored the range of substrate applications.

All the reactions were carried out in an inert atmosphere, which allowed me to become familiar with glovebox operations. In addition, it was the first time for me to use high-pressure gas cylinders and autoclaves from scratch. I was also able to learn how to conduct experiments in the field of catalysis development. There was a lot of experimental data, so I focused on conducting experiments at a good pace while organizing the results.



Fig. 1 (above) OIST center building; (below) Lab building 1–3 and the ocean

#### IV. Impressions

Through the internship, I was able to think about the points I mentioned as my motivation for the application.

First of all, I was able to utilize the experimental techniques and documentation skills I had learned through my research, which gave me confidence. In addition, I realized that although the fields are different, the essence of how to deepen the consideration of experimental results and how to organize experiments is the same. I would like to continue to improve my thinking skills as a scientist.

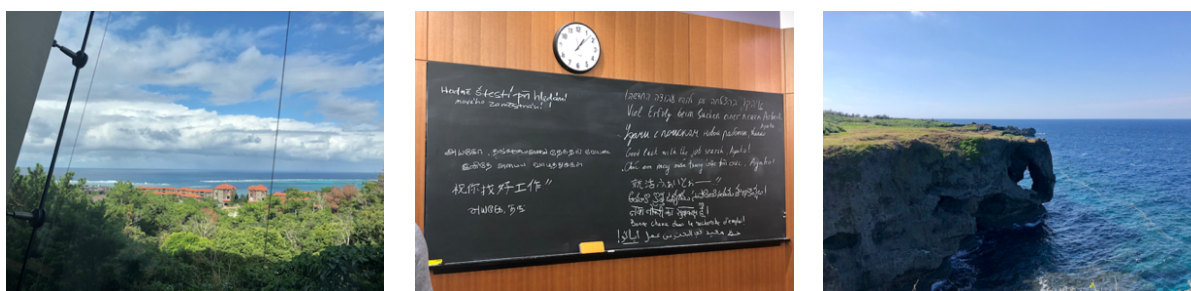
In terms of communication, I was keenly aware of my lack of English language skills, and felt frustrated many times, especially in daily conversations such as chatting.

Looking back on OIST as a research institution, it was a blessed research environment. There were specialized technicians for large equipment, and the IT-related matters (hardware such as PCs and printers, software such as analysis software, networks, etc.) were managed collectively by the university team, which made it very efficient. There were many post-doctoral researchers in the laboratory, and I felt a little envious that students could start their research with young researchers close at hand. In addition, not only the faculty members but also the administrative staff are fluent in English, and I thought that our university, which accepts a lot of international students, should learn from them. On the other hand, there seemed to be some problems due to the remote location of the island, such as being a bit far from the Japanese research community and taking a long time for reagents to arrive and equipment to be maintained.

In addition to my research, I enjoyed living with my roommate and interacting with the other interns. The interns specialize in a wide range of fields such as biology, physics, and psychology, and I was stimulated by them, who were working hard on research in various fields. At the same time, it was a culture shock to see interns from overseas universities discussing politics and gender issues even at drinking parties. I regret that I lacked the attitude to not only learn about social issues through the news, but also to think and have an opinion (this attitude of seeking output may be important in research as well).

#### V. Acknowledgement

I would like to express my heartfelt gratitude to the people of the Coordination Chemistry and Catalysis Unit of Okinawa Institute of Science and Technology Graduate University for accepting me for a three-month internship despite the prevalence of the coronavirus. In particular, I would like to express my deepest gratitude to Prof. Julia Khusnutdinova, Dr. Dilip Pandrey, who mainly guided me through the experiments, and Ms. Kyoko Chinen, the Research Unit Administrator, who helped me with accommodation arrangements and other administrative matters. I would also like to express my sincere gratitude to my supervisor, Prof. Mitsuhiro Shionoya, and my MERIT associate supervisor, Prof. Takashi Kato, for agreeing to participate in the internship program for a long period. Finally, I appreciate the MERIT program staff for providing me with a valuable learning opportunity in the form of MERIT practical exercises.



**Fig. 2** (left) View from the cafeteria; (middle) lab members wrote to me a message in thirteen languages; (right) Manza-mo, a famous place in Onna Village, about an hour's walk from OIST.