

Report on MERIT Long-term Overseas Dispatch

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Overview

I have visited Prof. Vladimir Golovko in the university of Canterbury (New Zealand) from Jan. 22th to Feb. 23th, 2018 to carry out research under the theme “Development of metal metal-oxide hybrid cluster catalyst”.

Background

Prof. Golovko visited our group in June 2016 and gave a lecture as a seminar of the department of chemistry. I got an opportunity to discuss my research topic with him for about an hour and have got to know each other. Since he has been working on a similar material to ours in the field of catalyst for a long time, I decided to visit him to learn the skills for preparation and characterization of catalyst and to compare the catalytic activity of my catalyst with that prepared in his group.

Research

The aim of this research is to develop metal metal-oxide hybrid cluster catalyst. Metal cluster, composed of less than a hundred atoms, has been paid attention as a new type of active center in the field of catalyst because it shows distinct catalytic activity compared to the bulk form. Metal oxide cluster is also known to exhibit unique acid-base property compared to the bulk one. In this study, we focused on the development of hybrid cluster catalyst based on the integration of the characteristic properties of metal and metal oxide clusters. The preparation procedure is as follows: 1. Synthesis of hybrid cluster with atomic precision as a precursor; and 2. Preparation of catalyst by deposition and calcination of a precursor on a support. I have synthesized the precursor in Japan and brought to New Zealand to prepare the catalyst and to evaluate the catalytic activity. The activity was compared to that of metal cluster catalyst developed in Golovko group to shed light on the effect of the introduction of metal oxide on the catalysis of metal cluster.

Life in the University of Canterbury

Golovko group was scheduled to move to a new building on the same campus at the end of 2017, but due to delay in construction, the first week of my stay overlapped with the period of delayed moving. Since the new building was still under construction, it was not permitted to do experiments there. Therefore most of the experiments were conducted in the old buildings, where some experimental setup was left for me (Fig. 1). Although I could not do any experiment in the period of moving, I felt it was a good opportunity to get along with group members while helping the moving. Prof. Golovko gave me the opportunity to have a presentation about my master's course research at the group seminar and also took me for lunch after the seminar (Fig. 2). It was my precious memory that I sometimes enjoyed lunch and dinner together with the group members and went on a tramping on weekend (Fig. 3).

Since this program was my first major overseas training, I had experienced a lot of hardship to live in a foreign country, which allowed me to feel the kindness of the people in New Zealand. Through the communication in the dormitories, universities, and cities, I thought I had a lot of experiences in addition to my research. The experiences of doing research at overseas university made me start to think about the possibility to build my career abroad. I would like to take advantage of this experience in Japan to support researchers from abroad.

Acknowledgement

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Fig. 1. Department of Chemistry, the University of Canterbury (old building).



Fig. 2. Lunch with group members

(I am in the front on the left and Prof. Golovko is in the last row on the left).



Fig. 3. Tramping with group members on weekend (I am in the left).