

Report on MERIT Long-term Overseas Dispatch

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Overview

I stayed and researched in India from 01 Oct. to 22 Dec. My research was conducted under the supervision of Prof. T. Pradeep in the Indian Institute of Technology, Madras. My research theme is to separate metal clusters using ion mobility mass spectrometry.

Before the dispatch

I have researched geometrical and electronic structures of ligand-protected metal clusters based on mass spectrometry. Pradeep's laboratory is famous for mass spectrometry of metal clusters with rigid sizes, which made me eager to study and research in his laboratory. Fortunately, Prof. T. Pradeep and Prof. Tatsuya Tsukuda (my supervisor) have known each other, and Prof. T. Pradeep kindly allowed me to stay and research in his laboratory. I synthesized a metal cluster of interest before the dispatch so that I was able to dedicate myself to measurements.

Research

In this research, I aimed at the isomer separation of metal clusters using ion mobility-mass spectrometry (IM-MS). IM-MS is a method to spatially separate structural isomers according to the shape of a molecule (collision cross section) and is applied to structural analysis of proteins. Metal clusters attract much attention because they exhibit size-specific properties. The application of metal clusters was thought to be difficult due to their instability, but now stable ligand-protected metal clusters are obtained at the ambient conditions. Furthermore, isomerism in ligand-protected metal clusters is widely reported, which leads to the attention in structural factors. In my research, I conducted the isomer separation of ligand-protected metal clusters using an ion mobility-mass spectrometer (Synapt G2 Si, Waters corp.). As a result, a new structural isomer of a ligand-protected metal cluster was observed. This supports structural diversity of ligand-protected metal clusters, and moreover, suggests the effectiveness of IM-MS. Data collection were finished and I am writing an article on it.

Life in Indian Institute of Technology Madras (IITM)

IITM is a nature-rich campus located in Chennai, one of the major cities in south India. I was supposed to live in a hostel in the campus except for the initial two weeks. I enjoyed the convenient environment where I was able to eat and sleep inside the campus. I was confused by English spoken in India at first, but I got used to their pronunciations and expressions, which gave me an interesting international experience. Several students from Nagaoka University of Technology came to IITM as exchange students. They told me how to buy foods and commodities in Chennai and helped me a lot. It was exciting to play the Japanese traditional dance Soran-Bushi together on a foreign land on the International Day.



The nature-rich campus

Acknowledgment

My supervisor Prof. Tatsuya Tsukuda gave me precious advice before and during this dispatch. Prof. T. Pradeep, who kindly accepted me in India, took care of me from research to daily life. All the members of the laboratory supported me both in research and in daily life. Ms. Papri Chakraborty and Mr. Abhijit Nag especially helped me with necessary procedures in life and the arrangement of the actual experiments. There was a delightful interaction with the students from Nagaoka University of Technology who invited me to join the Soran-Bushi on the International Day. This overseas dispatch is financially supported by MERIT. I deeply appreciated all the people who realized the dispatch and/or made it fruitful.