

Report on MERIT Long-term Overseas Dispatch

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Destination: Dresden University of Technology, Germany

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Research Topic: Functionalization of MOF alignment films by guest inclusion



<Research Project>

Professor Xinliang Feng at TU Dresden has fabricated conductive two-dimensional porous materials (MOF and COF) as oriented thin films. By combining their science with my technique of introducing guest molecules into nanopores, I tried to create hybrid electronic materials (Fig. 1).

As a host material, I selected an imine COF containing porphyrin backbones. The two-dimensional thin films were prepared by the SMAIS (Surfactant-Monolayer-Assisted Interfacial Synthesis) method developed by Prof. Feng's group. In the SMAIS method, the linker molecules are aligned on the air-water interface by electrostatic interaction with the surfactant, resulting in highly crystalline, oriented thin films. Uniform thin films were corroborated by spectroscopic analysis and microscopic observation. Next, I tried to introduce guest molecules into the nanopores of the thin films from solution, but the introduction was not successful. When I tried introducing them from the gas phase, sublimable molecules such as iodine and anthracene were successfully introduced, and guest-derived absorption was confirmed. I am planning to conduct detailed characterizations of obtained films and to evaluate physical properties such as conductivity and photo-charge separation dynamics in Japan.

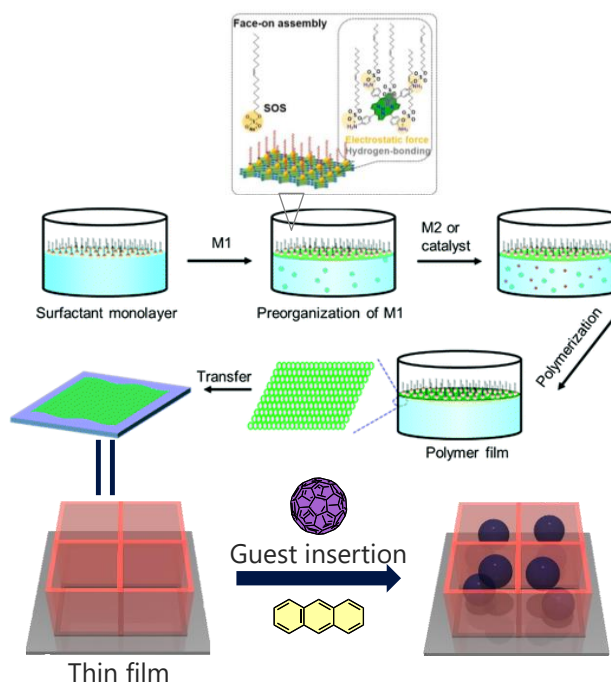


Fig. 1 Fabrication and functionalization of COF thin films.

<Research Life>

Prof. Feng's group was a very large lab consisting of over 80 students and postdocs, and each group had a different research topic. I belonged to the 2D polymer & interfacial synthesis group, but there was also a group working on graphene nanoribbons and organic magnetic molecules. I was really lucky to have an opportunity to give a presentation on my recent published topic. I was asked many questions and was told that my research was interesting, which gave me a lot of confidence.

I spent most of my stay at the International Guesthouse of the university. I shared a kitchen and bathroom with other students, so I had opportunities to speak English at home. I cooked for myself, and some of the students cooked dishes that I had never seen before, so I was able to experience different cultures.

Because of the high latitude of Europe, the weather was very comfortable compared to Japan. There was no air conditioner in the rooms of the guesthouse or the laboratory. Also, the days were long and bright until around 9:00 p.m., so I did not have to worry even if I stayed lab for late.

In Germany, there is a deposit system for bottles and cans, and if you take the empty container to a supermarket after drinking, the fee for the container will be returned. Although it is a bit cumbersome, there is no littering of empty containers (some people even scavenge trash cans for cash), and I felt it to be a good system. Also, the culture of greeting people at shops or even at elevators was very pleasant. This is what Japan could learn from. On the other hand, there are no public restrooms and convenience stores, so I often felt how convenient Japan is.

Dresden, also known as Florence on the Elbe, is a East German city famous for its beautiful cityscape of bridges, churches, and palaces. In Dresden, there were many famous humanoid pedestrian signals of the East German era, called Ampelmann. It was so cute that I even bought some goods. I was even able to find an Ampelfrau traffic light with a rare girl motif (**Fig. 2**) !

At the weekend, I traveled around Germany and Europe. As a chemist, I visited Kekule's tomb in Bonn and Auschwitz-Birkenau concentration camp. When I saw pile of empty cans of Zyklon B, I felt I had to use my skills of chemistry correctly. In addition, I participated in a marathon in Switzerland. I completed my 21st full marathon with a great view of the Alps (**Fig. 3**) .



Fig. 2 Ampelmann and Ampelfrau
(Ref: <http://comej.blog76.fc2.com/blog-entry-122.html>)



Fig. 3 The author completing the marathon.

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