

Elective Research Training of MERIT

Internship report

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Institute

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Overview

As an elective research training for MERIT, I participated in the internship at the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Ibaraki Prefecture. At the host institution group, they are conducting research on Prussian blue and its analogues. Prussian blue and its analogues have a structure in which metal ions are bridged by cyanide and are expected to have high adsorption properties due to their porous structure. In recent years, this research group has reported that Prussian blue and its analogues exhibit high ammonia adsorption property (A. Takahashi et al., *JACS* 2016). Although this report was conducted on powders, in order to develop further research with a view point of practical application, it is important to shape the powder and make it a processed body.

As a processed body of Prussian blue analogue, microcapsule beads developed by the same group was used. This microcapsule beads were prepared by the following method. First of all, the Prussian blue analogue was dispersed in an aqueous solution of sodium alginate. The solution was dropped to calcium chloride aqueous solution to make the particle consisting of calcium alginate and Prussian blue analogue. Next, microcapsule beads are prepared by freeze-drying the obtained particles. By performing freeze-drying, particle contraction due to water desorption is suppressed, and beads with many pores can be obtained. (K-M. Lee, et al. *RSC Adv.* 2016).

To evaluate the ammonia adsorption property, a breakthrough test of the microcapsule beads consisting of Prussian blue analogue was conducted. Breakthrough test is a method of measuring the volumetric gas adsorption capacity by flowing gas to the column packed with adsorbing materials and analyzing the amount of gas that passed

through. In this internship, we made the breakthrough test equipment and carried out breakthrough test of ammonia gas using microcapsule beads of Prussian blue analogue as adsorbent.

In this internship, I was able to learn about research especially for gases. Unlike solids and liquids, gases have various experimental difficulties such as invisibility. It was a very valuable experience for me to learn different fields through this internship.

Acknowledgment

I appreciate to receive long-term internship acceptance for 2 months at the National Institute of Advanced Industrial Science and Technology (AIST). I would like to express my gratitude to Dr. Tohru Kawamoto, who is the group leader of the host research group, Dr. Akira Takahashi, who is the person in charge of this internship, and all members of the same group. In addition, I would like to express my gratitude for the Materials Science Leader Training Program MERIT, and to Professor Shin-ichi Ohkoshi for allowing us to participate in this internship.



Picture of AIST Tsukuba Central 5.