

# STEPS Students Report

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I had the science internship on Department of chemistry, School of Science in University of Tokyo. My research was mainly under the leadership of Mariko Miyachi, Raphael Salles. They helped me to organize my experiments and process data. The main theme of my internship at the University of Tokyo was monodispersed Au nanoparticle synthesis.

The first week was devoted to the synthesis of Au nanoparticles (Au NPs). I, together with my sensei — Mariko Miyachi, synthesized two samples of nanoparticles. Hexanethiol-protected Au nanoparticles were prepared by the Brust method. The process of the synthesis was quite long and consisted of mixing of solutions, centrifugation, washing, drying and many others. At the second week we used the reprecipitation method to prepare the single-sized Au NPs and to increase the monodispersity. In the following weeks we examined two samples with a TEM (Transmission electron microscopy) microscope. Images of about 200 nanoparticles were obtained. (Fig. 1)

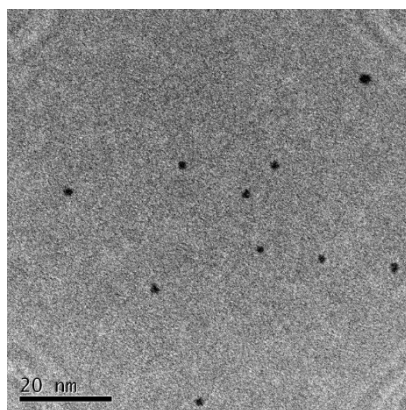


Fig. 1. TEM image of first sample of Au NPs.

Due to the average diameter and average deviation of the nanoparticles of the two samples were measured. As a result of this method it was found out that the first sample is better suited to us in monodisperse parameters. And the average diameter was  $(2.0 \pm 0.6)$  nm. At such sizes Au nanoparticles shows single electron transfer events at room temperature due to its quantum size effect. Besides, using the L&B device and our NPs, we

obtained samples of nanosheets from our Au NPs. The obtained film samples were studied by means AFM (atomic force microscope) and SEM (Scanning electron microscope) microscopes. With the help of these two microscopes we analyzed the nanosheets for the presence of holes and irregularities. Thus we found out that by reducing the work surface in the device, we got more uniform films. And also checked whether there is conductivity in these samples. Nevertheless, the conductivity was indeed detected.

If the week were devoted to work in the department, then on the weekend I had a rest and looked around the fairyland Japan. I was happy to explore Japanese culture, traditions and nature. Probably the most memorable places for me were the Senso-ji temple, a trip to Kamakura and a trip to Kyoto. I would like to thank all those who promote this excellent exchange program in science and once again say thank you to the professor's department for the opportunity to study in his laboratory.

I got a lot of experience and knowledge, working at the Department of Inorganic Chemistry. In addition, I have learned to work with different types of microscopes, which will undoubtedly be a huge plus in my scientific work. In addition, I will be able to apply the knowledge and skills of synthesizing nanoparticles at my department of Molecular biophysics to synthesize similar nanoparticles, but which can be used as drug delivery. I would be happy to return to Japan and continue my studies in this area.