

STEPS Students Report

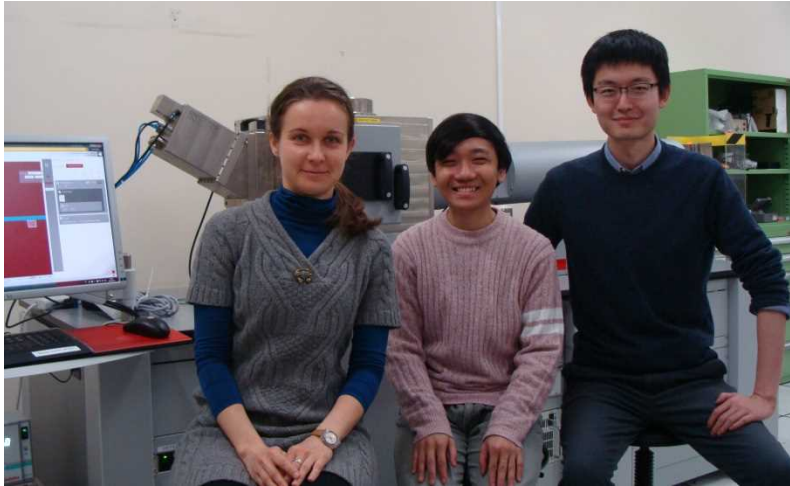
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My current research interest is connected with the synthesis and thorough study of polymer microgels—soft thermo- and pH-sensitive particles with the diameter about 100-1000 nm. To precisely evaluate its properties, I need to investigate the shape and inner structure of such particles in different conformational states, especially in case of interpenetrating network microgels. To achieve that, I needed to learn different advanced experimental techniques.

Laboratory of Professor Shibayama in the Institute for Solid State Physics, The University of Tokyo, is a world-famous laboratory specializing on the exploration of soft matter objects properties using dynamic and static light scattering (DLS&SLS), small-angle neutron scattering (SANS) and small-angle x-ray scattering (SAXS) methods. So that was the perfect laboratory to study my microgel systems. I was happy to know that, with the help of STEPS program, I would be able to spend one month in this Laboratory.

Before my arrival to Japan, I discussed with Professor Shibayama the planned experiments and prepared the set of the samples for investigation. During my stay in the laboratory I was able to use different instrumental techniques for the study of microgels – DLS, SLS, SAXS. SLS and SAXS were completely new to me, so I learned from the laboratory members how to use these complicated instruments. I was very happy to have an opportunity to work with SAXS machine in Tokai. We with colleagues from the Lab went to Tokai laboratory branch for a few days for the experiments (Picture 1). That is a very advanced instrument and only a few laboratories in the world have it, so it was an excellent chance to try this new method. Most of my experiments I performed using SLS method in Kashiwa Campus main laboratory. I was able to collect the full set of the data for my series of the samples, which are about 20 different variations of pH and temperature.

The most difficult part of scattering experiments is the interpretation of the obtained data. Fortunately, Professor Shibayama and his laboratory members specialize on this, so they helped me a lot with understanding of my results. I learned many new things: theory of scattering, the methods and principles of peak fitting, even new software. The last few days in Kashiwa Campus we spent discussing the possible fitting models of the experimental curves.



Picture 1. With SAXS instrument (E. Kozhunova, C. Gupit, Dr. X. Li).

Now, our group in Moscow State University works under computer simulation of the same objects for better visualization of the results. That will allow us to compare experimental and theoretical data, which is of great interest for my field of study. We continue to collaborate with Professor Shibayama, and I hope to publish a paper with the results obtained during STEPS program.

Of course, during this one-month stay in Japan I was able to visit some touristic places and to get the flavor of Japanese culture. First of all, I was lucky to be there in time of Plum blossom season and Cherry blossom season and to go to hanami. The park near Kashiwa Campus of Tokyo University has very beautiful Sakura alley and exquisite Plum groves. Also there is a beautiful traditional Japanese garden with tea-house, where I was invited by Professor Shibayama to attend the tea ceremony, and I enjoyed it very much (Picture 2). Several times I went to the center of Tokyo and spent one weekend in historical Kyoto. Overall, I had a really great time in Japan – both from scientific and cultural points of view. I am very grateful to STEPS program, Tokyo University, Professor Shibayama and laboratory colleagues for such an opportunity. Thank you!



Picture 2. Tea ceremony (M. Suzuki, E. Kozhunova, Prof. M. Shibayama).