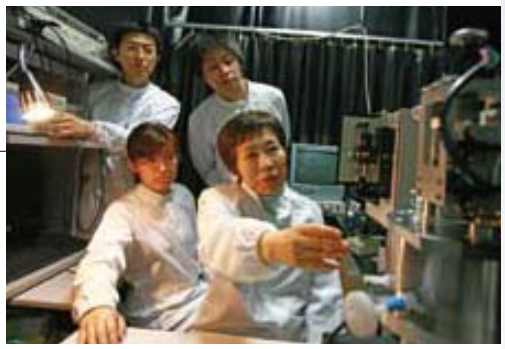
Revealing an "unknown interaction of molecules" using surface forces measurement

Professor Kazue Kurihara

Interface PhysChem Laboratory, Soft Materials Group, Advanced Institute for Materials Research (WPI-AMIR), and Nano-surface Chemistry, Measurement Research Division, Institute of Multidisciplinary Research for Advanced Materials

Born in Tokyo in 1951. Completed the doctoral course, Department of Industrial Chemistry, School of Engineering, University of Tokyo. Ph.D. in engineering. Worked as Technical Assistant at the University of Tokyo, then a postdoctoral fellow at the Department of Chemistry, Texas A&M University, a postdoctoral fellow at the Department of Chemistry, Clarkson University, a researcher at the Research Institute for Production Development, Visiting Researcher at the Institute for Surface Chemistry, Group Leader at the Research Development Corporation of Japan. Appointed Associate Professor at the Department of Applied Physics, School of Engineering, Nagoya University. Appointed Professor at the Institute for Chemical Reaction Science, Tohoku University, in 1997, and at the Institute of Multidisciplinary Research for Advanced Materials, reorganized from the former Institute in April 2001. Has been in current position since 2010.

http://www.tagen.tohoku.ac.jp/labo/kurihara/index.html



Prof. Kurihara and the members of the Nano Surface Chemistry Laboratory. They are cheerful and lighthearted in spite of the fact that they engage in work in a severe area where extremely high precision is required more than anything. In this laboratory, every day measurements take place to elucidate an extremely small world scaled in nanometers.

Interactions like attraction and repulsion between magnets also exist between molecules. These intermolecular interactions are an area of study for Professor Kurihara and the members of her laboratory. The measurement of intermolecular surface forces, among others, is the main matter that they are dealing with. In other words, they are measuring the distances and forces with which such interactions occur among various molecules. Resulting measured values can be a key to understanding specific intermolecular interactions.

This area of measurement of surface forces deals with extremely small objects observed on the nanometer scale in research. Thus, the measurement requires extremely high precision, and this area of research is full of challenges, including maintenance and improvement of research facilities. Not many researchers have chosen this area for their work. Under these circumstances, Professor Kurihara and the members of her laboratory have developed new approaches and new apparatus by themselves. A lot of apparatuses that they have developed are viewed with keen interest by other researchers in the same field.

Some interactions among molecules exist close to you. For example, the light or moist sensation of lotion, or a mechanism to increase the viscosity of a sealing material used in buildings, are attributed to a micellar aggregate of surfactant that easily deforms, or interactions that occur among liquid molecules. It is interesting that the process of elucidating an unknown world on the nano scale leads to discoveries and advances in areas of daily life. In fact, their laboratory has often received unanticipated inquiries from businesses.

One of their future research themes is interactions among liquid molecules, which are mostly unknown. Furthermore, they are considering developing a new apparatus that integrates electrochemistry and optical engineering to increase research possibilities.

The twin-path surface forces apparatus, among others, that Professor Kurihara *et al.*, have developed attract the most attention. This apparatus is rated highly because it can be applied to materials close to our daily life. It is easy to use for surface forces measurements, which have so far taken place in a special, distant world performed only with transparent samples. It enables the application of these measurements to general uses.

A surface forces apparatus is fully disassembled and stored immersed in ethanol each time it is used, in order to prevent even extremely small particles of dust from entering, which could damage its precision.

My favorite

Prof. Kurihara often works at a PC for several hours. She stretches with a balance ball every two or three hours. The space for stretching is at the back of the table, and cannot be seen from the doorway. Thus, she sometimes surprises students who come to this room because she is "audible but invisible."