Report on European Summer School & 2nd Japanese-German Student Workshop

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It was held that European Summer School under the theme of "Low Temperature Plasma Physics: Basis and Applications" and "The Physics and Technology of Fusion Plasma" for eight days in Physics Bad Honnef, Germany.

In "Low Temperature Plasma Physics: Basics and Applications", we studied the base of low temperature plasma, for example, the base of the plasma physics, the base of the gas electrical discharge, the measurement of plasma, the model of plasma and the surface reaction of plasma etc. Especially "Fundamentals of Gas Discharges" and "Plasma-Surface Interaction" were bases of own research, and useful contents for the research in the future.

In "The Physics and Technology of Fusion Plasma", we studied the base and the application of the fusion plasma. I could get the great deal of knowledge for fusion plasma, because it was a lecture of different plasma when I studied it usually.

Moreover, it was 60 people or more from various countries that participated in this school, and I was able to enhance mutual understanding through international exchange in the poster session and the dinner, etc. It became experiences that were able to hear the story from researcher in various countries because there was no chance to know the research of the plasma and the life of another country.

It was held that 2nd Japanese-German Student Workshop for three days in Ruhr-University Bochum, Germany.

I gave a presentation under title of "Control of Plasma Etching Process through Substrate Temperature Measured by Optical Fiber-type Low-coherence Interferometer". The content of the presentation is the control of the etching profile in the plasma process of low-dielectric constant (low-k) interlayer insulation films. Low-k interlayer insulation films were paid attention to solve increasing of the signal delay according to minute of the critical dimension of large-scale integration (LSI). Recently, as the critical dimension of LSI is scaled down, the control of pattern profiles with an accuracy of a few nanometers should be achieved in the near-future etch technology for low-k films. In this study, we have monitored the substrate temperature with high accuracy in real time by an optical fiber-type low-coherence interferometer. Furthermore, we estimated the correlation between the substrate temperature and the etched profile in order to realize a real- time-controlled precise etching process. As a result, we turned out that it is difficult to etch the vertical profile with constant gas flow rate. Then we designed the new process which varied the radical density ratio in accordance with the temperature, and we have successfully achieved vertical profile.

Through this workshop, students of Japanese and German were able to discuss actively in the question time, and we could talk about the research each other in the break time after presentation.

In the second day of the workshop, we visited three laboratories of Rule-University Bochum. There were characteristic laboratories that measured the base of plasma and did the plasma process of application. The student of each laboratory explained the device and the research, and we could discuss their research for details. As for the laboratory, the arrangement order was much performed in order to be able to experiment efficiently, and there were a lot of points that had to be learnt.

Through this German short dispatch, I studied the base of plasma and exchanged with many students who were researching plasma in various countries, and it became a very significant experiment. I will make the best use of this experience for the research in the future, and want to make an effort to become a researcher in the plasma who passes in the world in the future.