

Report of MERIT Long-Term Dispatch Program

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I visited ETH Zurich in Switzerland, from July 31st to October 27th. ETH is one of the top level universities in the world. As many as 21 Nobel prizes have been awarded to students or professors of the university. Especially it is well known that Einstein and Röntgen graduated from ETHZ. I visited Prof. Fiebig group, and they research about nonlinear optics. The staff and students come from all over the world such as Switzerland, Germany, France, Italy, Spain, Iran. I found difficulties and pleasure in communicating with people who have different backgrounds during my stay.

One problem when we stay in foreign countries might be speaking foreign language. In my case, there were not so many problems when we talk about research, but I sometimes found difficulties in talking about daily life conversation, since they talk about various themes. However, I tried to actively participate in the conversation, and now I became able to enjoy conversation about various topics. As for the experiment, my specialty is the optical properties, but I have not used the nonlinear optical techniques. Although initially I was a little bit confused, finally I could learn a lot of things about nonlinear optics, such as the alignment method.

Through the stay for 3 months, I realized the importance of diversity. The laboratory members were always enjoying experiments. Their attitude to research encouraged me many times. In this way, it was a very valuable to experience different cultures and thinking. More than anything, it will be the property that I could have friends in all over the world.



Fig. 1 One scene in Zurich

Research: Observation of nonlinear optical magnet-electric effect.

Professor Fiebig is the leading researcher in the field of nonlinear optics in multiferroic materials. The group also researches about THz, pump-probe spectroscopy, AFM and PLD thin film. We have in common that we research about interaction of light and multiferroic materials, while I have never performed nonlinear optics. Thus I thought that it was possible to learn a new technique while taking advantage of my strengths. The research theme is as follows.

Recently, it has been shown that novel optical phenomena emerge from the interference between electric and magnetic responses in multiferroics. These effects are called as optical magneto-electric (OME) effects. A typical example is the direction dichroism, where the optical absorption changes with the propagating direction of light. Similarly, it is expected that SHG intensity should change by the reversal of the propagating direction of the incident light. My research purpose is to observe this nonlinear OME effect.

Experimentally it is difficult to realize the reversal of the propagating direction of light, so we measured the change in the SHG intensity by the reversal of the external magnetic field. As a result, I observed the change in the SHG intensity by reversal of the magnetic field. However, it is still ambiguity that the change in the intensity originates from the nonlinear OME effect, or not. Thus, I would like to continue to discuss with Prof. Fiebig group, and reveal the details.

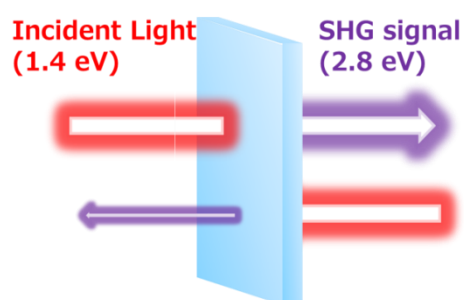


Fig. 2 directional dependent SHG signal

Acknowledgment

I really appreciate MERIT program, my supervisor Prof. Takahisa Arima, Prof. Manfred Fiebig and his group for giving me such a valuable opportunity.