# 1．5 外国人研究員成果報告

## Visit of Yamaguchi University, Department of Electrical and Electronic Engineering
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Assoc. Prof. P. Maly
Department of Chemical Physics and Optics,
Faculty of Mathematics and Physics, Charles University, Prague,
Czech Republic

### Introduction

I met Prof. Miyoshi during his participation at the International Conference on Luminescence in Prague during summer 1996. In fact, there has been a large overlap between his and my research interests. Prof. Miyoshi invited me to visit his group at Yamaguchi University. The visit was supported by Japanese Ministry of Education and I was very pleased that I was able to spent there nice five weeks which turned out to be very useful from both scientific and general points of view. Besides throughout scientific discussions and joint experiments using top quality equipment of Venture Business Laboratory, I was able to learn a little bit of Japanese way of life and research, and I hope I was able to say something about my country to many people I met.

### Research

My field of research involves ultrafast laser spectroscopy of semiconductor nanocrystals embedded in glasses. In particular, I concentrate on the II-VI semiconductor compounds as CdS, CdSe and CdSSe. These materials are considered as very prospective in optoelectronics, e.g. for ultrafast all-optical switching. They are also very interesting from the viewpoint of basic research as systems in which charge carriers are confined in all three dimensions (quantum dots). The materials have typically optical nonlinearities with large magnitudes and fast response times. However, their properties are influenced by illumination by laser light. This phenomenon is called effect of photodarkening, its microscopical mechanism is not yet clear, and its presence restricts severely the application possibilities at present time. Couple of years ago, I measured the dependence of the magnitude of ultrafast transient absorption on the light exposure which I explained in terms of increase in number of energy states in the material during the light exposure. Prof. Miyoshi at Yamaguchi University happened to measure the same increase by different technique of esr spectroscopy. The group of Prof. Miyoshi has obtained series of fundamental results concerning photodarkening.

It is always very nice to find somebody with the same research interests somewhere in the world. But the coincidence was even stronger in this case : The Venture Business Laboratory opened recently a new laser laboratory for femtosecond spectroscopy with top-quality equipment. In this way, the programme of my visit at Yamaguchi University could involve not only detailed discussions of preliminary experiments done on both sides but also the joint experiments of ultrafast laser spectroscopy. I was really happy to be able to use the femtosecond laser system (Spectra Physics) in connection with ultrafast streak-camera (Hamamatsu) to study the effect of laser exposure on the dynamics of photoluminescence. I really enjoyed the cooperation during experiments with Prof. Miyoshi, his students and also with Prof. Kasatani. After proceeding the experimental data, we plan to publish the results in a joint paper. It was very interesting and stimulating for me to discuss in great detail with Prof. Miyoshi the recent results of his group. Prof. T.

Miyoshi plans to visit the Charles University in Prague during summer 1998 and we plan further joint experiments.

I have to say that I was really impressed by the quality of the scientific equipment in Venture Business Laboratory. I had the opportunity to have discussions with some other Professors of the faculty and I always witnessed great determination and very high quality of research. After a comparatively short period spent in Japan it is apparently impossible to draw comparison of the organisation of research in both countries. My impression of Prof. Miyoshis group was that of well organized, effectively and hard working research team with high rate of published papers.

### Teaching, students, education

I was pleased to give a lecture to Faculty members followed by an interesting discussion. I shared the office with the students of Prof. Miyoshis group and I enjoyed the everyday informal meetings with them. My feeling is that the students in Japan spend most of the day at the Faculty working there not only on the research tasks but also preparing themselves for their tutorials. In our country, students prefer to study at home and/or in the library. I was moved when all students of the Prof. Miyoshis group came to the Yamaguchi airport to say good-bye to me on my departure.

### Visiting other university in Japan

During my visit to Yamaguchi University I had a chance to go to Tsukuba University for a short -period visit. I was warmly accepted by Prof. Masumoto working in the field of quantum dots. He is also the Director of the Erato project Single quantum dot. I was impressed by the quality and extent of the equipment available to Prof. Masumoto both at the University and under the project. At the same time I had the opportunity to discuss some of the recent results of Prof. Masumoto and his coworkers as well as the organization of the Erato project system which has no similarly established counterpart in the Czech Republic.

### Future cooperation

Ultrafast optoelectronics is no doubt a very rapidly developing field and it is of great advantage to have a chance to cooperate in research with other laboratories with similar scientific topics. There are not many research groups investigating the effect of photodarkening described above and Prof. Miyoshi is one of the leading experts in this field. Moreover the experimental facilities in Ube and in Prague are in greater part compatible. It would be therefore very useful to continue mutual cooperation which should increase the effectivity of research on both sides. It is very nice that Prof. T. Miyoshi is able to come to Prague during summer 1998 when we can continue our joint work. I hope we will be able to find ways of extending our collaboration in the future.

### Summary

Looking back I feel my visit to Yamaguchi University, Department of Electrical and Electronic Engineering was very fruitful for me. I gained a lot from the scientific discussions with Prof. Miyoshi, we successfully carried out joint experiments, I was able to be in touch with students of Yamaguchi University. I will always remember the warm welcome in Japan. I have to acknowledge the support of the Japanese Ministry of Education. I would like to express my deep thanks to Prof. T. Miyoshi for inviting me and undertaking all the organization of my visit. I am grateful to the President of Yamaguchi University and the Dean of the Faculty for accepting me at the Faculty and the Venture Business Laboratory. Finally, I would like to thank Mr. Kawamoto and all the students of Prof. Miyoshis group for their general support and fruitful discussions. I hope that this visit will turn out to be the beginning of our joint research work in the future.