JSAP Award Recipients

The JSAP has established three awards for outstanding research papers. Award A is for papers published in the Japanese Journal of Applied Physics; Award B for papers published by scientists younger than 35 years of age; Award C is for review papers published in 'OYO BUTURI', the JSAP membership journal. In this issue, we feature the three receipients of Award B for 1999.

Takashi ASANO (member) graduated from the Department of Electrical Engineering and Science at Kyoto University in 1994. He completed a doctoral course at Kyoto University in 1998, and was awarded a Dr. Eng. degree. He then obtained a JSPS Research fellowship at the same university, and in 1999 was awarded a PD fellowship in Kyoto University Venture Business Laboratory. He has been engaged in research on ultrafast optical phenomena and electron relaxation process in intersubband transitions, which is aimed at the development of ultrafast all-optical modulators. He is a member of the Institute of Electronics, Information and Communication Engineers.

Intersubband optical transitions in quantum wells are very promising for ultrafast optical modulation or switching devices, since the relaxation times can be in the picosecond or sub-picosecond range. We have proposed and investigated an unique modulation scheme which is based on the nonlinear interaction between the intersubband and conventional interband transitions. The ultrafast (~1 ps) operation of the proposed scheme has been demonstrated by 2-color intersubband pump (7μm) – interband probe (800nm) measurements. However, one problem must be resolved before this scheme can be used in practical applications, which is that the wavelength range is usually in the mid- to far-infrared regions (4 ~ 10 μm). In order to overcome this limitation, we have adopted a structure based on InGaAs / AlAs quantum wells grown coherently on a GaAs substrate, and achieved an intersubband transition in the near-infrared, at a wavelength of 1.90 μm.

In this work, we measured the relaxation time of such an intersubband transition for the first time. The measurements were made using absorption saturation techniques, taking into account the effect of homogeneous and inhomogeneous broadening. We also examined the origins of the broadening of the absorption spectra. The measured relaxation time was very fast (1 ~ 10 ps), which is similar to that of the mid-infrared intersubband transition. We have subsequently measured the relaxation time more accurately using the femtosecond pump-probe method, and obtained a value of approximately 2.7 ps in the case of 2.5 μm intersubband transition. This work demonstrates that the near-infrared transitions are promising for ultrafast applications.

This work was performed under the supervision of Prof. S. Noda, Kyoto University and supported in part by Grant-in-Aid for Scientific Research from the Ministry of Education, Science, Sports and Culture of Japan, Asahi-Glass Grant, and VBL Kyoto University.

Akihiko FUJII (member) graduated from the Department of Electronic Engineering at Osaka University in 1993, and obtained a Doctor of Engineering Degree from the same university in 1997. He was then awarded a research fellowship of the Japan Society for the Promotion of Science. In 1998, he returned to the Department of Electronic Engineering of Osaka University as a research associate. He has been engaged in research on optical and electrical devices utilizing organic materials, including dye molecules and conducting polymers. He received a Promotion Award from the Kansai-Section Joint Convention of Institutes of Electrical Engineering in 1996, and from the Institute of Electronics, Information and Communication Engineers in 1997. He is a member of the Japan Society of Applied Physics, the Institute of Electrical Engineers of Japan, the Physical Society of Japan and the Institute of Electronics, Information and Communication Engineers.

Cylindrical microcavity structures, such as microrings of p-conjugated conducting polymers, poly(2, 5-dialkoxy-p-phenylene vinylene) (ROPPV), were fabricated on optical fibres to form an optically pumped laser and a light emitting diode (LED). An extremely low excitation threshold for lasing was demonstrated with the microring structure. Microring LEDs with a cylindrical geometry of Al/p-conjugated conducting polymers, ROPPV and ITO were fabricated for the first time on 125 μm optical fibers, and orange electroluminescence was observed upon application of an electric field. These results suggest that it may be possible to fabricate an electrically pumped conducting polymer laser diode.

Jun-ichi SHIRAKASHI (member) obtained a B.S. degree in electrical and computer engineering from Yokohama National University, Kanagawa, Japan, in 1990. He then moved to the Tokyo Institute of Technology, where he studied electrical and electronic engineering, gaining an M.S. in 1992 and a Ph.D. in 1995. During his postgraduate work, he was engaged in research on the MOMBE growth of III-V compound semiconductors and heterojunction bipolar transistors (HBTs) with an ultra-high carbon-doped base. In 1995, he joined the Electrotechnical Laboratory, Tsukuba, Japan, where he worked on single electron transistors (SETs), and novel ultra-fine nano-lithography techniques using scanning probe microscopes (SPMs). He demonstrated the room temperature operation of niobium (Nb)-based SETs in 1997. In this study, the basic SET structure was fabricated by SPM-based nano-lithography and the junction area was further reduced by thermal oxidation. In 1999, he moved to the Department of Electronics and Information Systems at Akita Prefectural University as an associate professor. His current interests lie in novel nano-lithography techniques and quantum nano-scale devices and systems.

He is a member of the Japan Society of Applied Physics, from whom he received the 3rd JSAP Awards for Research Paper Presentation in 1998 and the 21st JSAP Award for the Most Promising Young Scientist (Award B) in 1999.