


<b>Basic Research of Photo-Generated Carrier Behavior in Semiconductors</b>		
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### Research Topics

- Fundamental research on photoluminescence characteristics of ZnO crystal
- Fundamental study of carrier behavior in GaAs/AIAs superlattice
- Proposed on new quantum structure and its application to the Optoelectronic devices

### Research Seeds

Wide-band-gap semiconductor materials (ZnO) and quantum confinement system of semiconductor materials have attracted considerable interest in recent years because of their various remarkable physical properties and potential applications in a number of emerging areas such as optoelectronics and photonics.

To improve device performance, it is important to ascertain the behavior of carriers in the devices. Within the devices are three processes: carrier generation, transport, and recombination. Furthermore the transport and the recombination processes are mutually competitive. Therefore, we are trying to realize the performance improvement of optoelectronic devices by clarifying the carrier behavior in semiconductors through systematic measurements of carrier luminescence and transport properties.

Fig. 1 portrays a PL measurement apparatus. PL was excited using the 325 nm line from a He-Cd laser with power of 15 mW. The samples were mounted in an optical cryostat where the temperature can be varied from 10.0 to 300 K. We are attempting to realize simultaneous observation of both light emission and transport of carriers by adding an electric field application (current detection) function to the measurement system.

Fig. 2 shows the temperature dependence of PL spectra of a ZnO single crystal. One can find from Fig. 2 that the PL spectral shape of ZnO varies complicatedly with temperature. This complicated shape change is caused by a change in the origin of luminescence with respect to temperature. Because the distribution and relaxation processes of photogenerated carriers differ from those of temperature, the PL characters of ZnO can be clarified by measuring the ZnO carrier behavior.

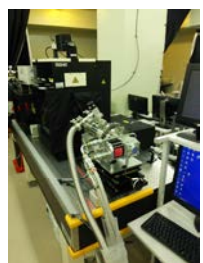


Fig. 1. Experimental Setup.

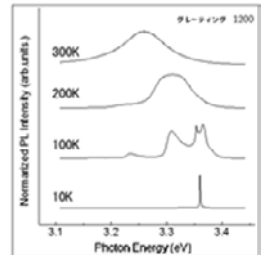


Fig. 2. The temperature dependence of PL spectra of ZnO.

### Related Technology

- Optical measurement
- Improvement of LED characteristics