Symposium (Oral) | Symposium (technical) | Materials Science and Advanced Electronics Created by Singularity of Nitride Semiconductors -Development of New Functionality and Expansion to Electronic and Optical Devices-

[18p-E101-1~7]Materials Science and Advanced Electronics Created by Singularity of Nitride Semiconductors - Development of New Functionality and Expansion to Electronic and Optical Devices-

Hideki Hirayama(RIKEN), Yasuo Koide(NIMS)
Wed. Sep 18, 2019 1:30 PM - 5:30 PM E101 (E101)
△ : Presentation by Applicant for JSAP Young Scientists Presentation Award
▲ : English Presentation
▼ : Both of Above
No Mark : None of Above

4:00 PM - 4:30 PM

▲[18p-E101-5]Recent progress and future of GaN and GaAs-based THz-QCL

○Ke Wang[1,2], Li Wang[2], Tsung Tse Lin[2], K Fukuda[2], Hideki Hirayama[2] (1.Nanjing Univeristy, 2.RIKEN, RAP)
Keywords:quantum cascade laser, GaN, MBE
Terahertz (THz) quantum cascade lasers (QCLs) are semiconductor-based compact coherent THz sources. The operating frequency of traditional GaAs THz QCLs covers from 1 to 5.4 THz. However, the operation temperature has been limited up to 200 K for about a decade. We have revealed an extra carrier leakage channels via some high/excited energy states, which is distinct from the conventional thermally activated leakage channels and can be suppressed by engineering high-energy states. A new type asymmetric two-well indirect injection THz QCLs for breakthrough the 200 K bottleneck is proposed. More important, the potential of a new material system, GaN, for next generation THz QCL will be discussed. GaN with its 91meV phonons can in principle allow THz QCLs to operate at room temperature or even higher. They would be key coherent sources in the unexplored terahertz frequency range of 5.4-12 THz, in which GaAs THz-QCLs are not able to work due to the Reststrahlen band. Recent progress on MBE growth and fabrication of GaN THz QC structures will be discussed.