Faculty of Engineering
Tokushima University

Optical responce of semiconductor nano-structures and device application

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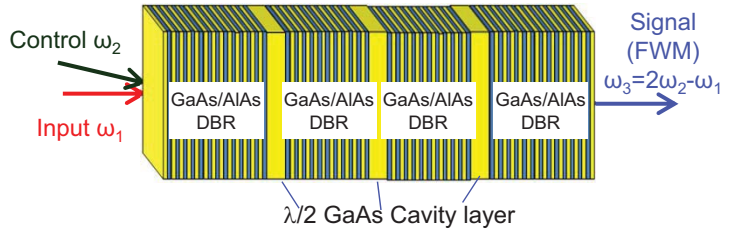

Fig.1 Triple-coupled cavity for wavelengh-conversion devices

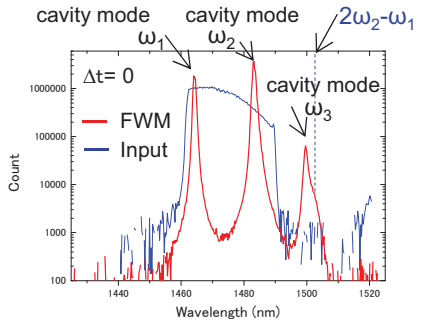

Fig.2 Spectra of FWM and input signals

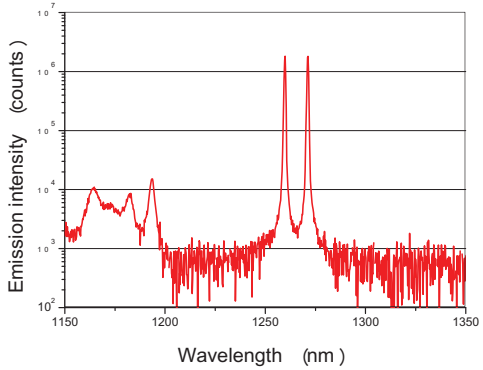

Fig.3 Spectrum of two-color emission of a coupled cavity structure for a THz light emitting device

We are investigating a planar-type ultrafast wavelength-conversion device operating at communication wave bands. A triple-coupled GaAs/AlAs multilayer cavity (Fig.1) enhances optical electric fields of its own three cavity-mode frequencies, wavelength conversion through the four-wave-mixing is realized with high efficiency. We have demonstrated wavelength-conversion signals 1.5μm bands.(Fig.2) We also demonstrated that InAs quantum dots (QDs) embedded in a strain-relaxed InGaAs layer showed large nonlinearity in the communication wave bands with ultrafast responses of 1ps in the semiconductor multilayer cavity. We are developing a device structure with such QDs in order to obtain more enhanced wavelength conversion signals.

We also investigate terahertz-light emitting devices operating by current injection at room temperatures. To realize the devices, we are developing a two-color surface emission laser with difference frequency of terahertz region. We have demonstrated two-color emission from InAs QDs in an active layer by optical pumping. (Fig.3)

These subjects are performed by collaboration of all staffs in our laboratory.

Keywords : optoelectronics, semiconductor technology, optical physics

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