ADVANCED MATERIALS AND DEVICES LABORATORIES
SCHOOL OF ENGINEERING, UNIVERSITY OF TOKYO

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SEMINAR ANNOUNCEMENT

Ptof. Yong-Hang Zhang

Department of Electrical Engineering and Center for Solid State Electronics Research,
Arizona State University, Tempe, AZ, USA

"Optoelectronics Research at ASU"
"InGaAs/GaPAsSb Quantum Wells for 1.3μm VCSEL on GaAs"

DATE: **Friday, June 25, 1999**
TIME: **9:00 am-10:00 am**
PLACE: **Rm. 400 (会議室)**
4th Floor, Engineering Building 10

Abstract

This talk consists of two parts: 1) General discussion about the research in the MBE & Optoelectronics Research Group at ASU; and 2) A novel approach for potential 1.3 μm VCSEL based on GaAs substrate.

Part 1: The MBE & Optoelectronics Research Group is very active in the research on optoelectronic devices and materials grown by MBE. There are 3 MBE chambers in the group, which can cover almost all common III/V compounds (In, Ga, Al)(As, P, Sb) except nitride. The research on MBE includes in-situ real-time feedback control or MBE using spectroscopic ellipsometer, a novel method to measure RHEED oscillations during substrate rotation.

Part 2: 1.3-μm VCSELs are highly desirable devices for use in optical data links, semiconductor chip interconnects, and local area networks. To overcome the thermal and refractive index limitations of the InGaAsP/InP material system, devices grown on GaAs have been proposed. In this talk, we report detailed theoretical study and preliminary experimental results on novel InGaAs/GaPAsSb quantum well structures. Based on Model Solid Theory and taking into account strain effects, the band edge alignment for the proposed QW structure is determined to be type-II. Using a straightforward two-band model, the materials gain of a thin $In_{0.4}Ga_{0.6}As/GaP_{0.15}As_{0.4}Sb_{0.45}/In_{0.4}Ga_{0.6}As$ QW structure has been calculated. It can reach more than 8,000 cm^{-1} under injection of 10^{19} cm^{-3}. Experimentally, several samples and device structures have been grown using MBE. Strong room temperature band-to-band photoluminescence has been observed from the InGaAs/GaPAsSb QW structures at wavelengths from 1.2 μm up to about 1.5 μm, depending on the composition of the GaPAsSb layer. Room temperature EL has also been observed at wavelengths close to 1.3 μm from a laser structure. Stronger EL with narrower FWHM was achieved at low temperatures. Temperature dependent measurements down to 20 K have revealed a peak wavelength shift of 3.5A/K. Detailed TEM study of several samples has shown smooth InGaAs/GaAs interfaces and clear QW profile.

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Refreshments will be provided.

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