Faculty of Engineering
Tokushima University

Growth of InAs quantum dots by molecular beam epitaxy

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①Fabrication of δ-doped p-InAs QD laser

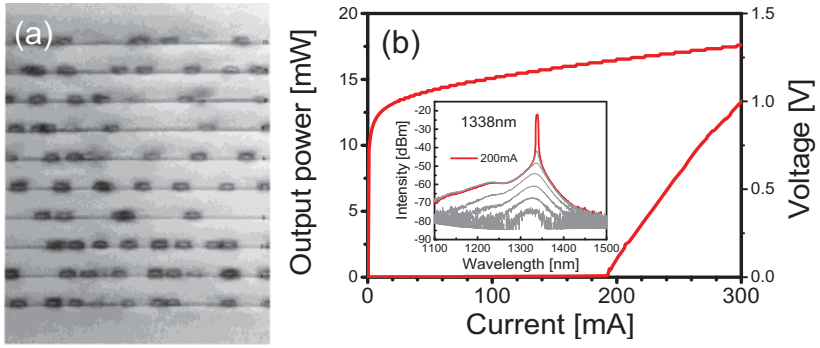

Fig.1 (a) Cross-sectional TEM image of 10 layer-stacked delta doped p-InAs QDs laser diode (b) 1.3μm lasing spectra of p- InAs QDs laser diode at RT.

②Fabrication of low density InAs QDs for single dot spectroscopy

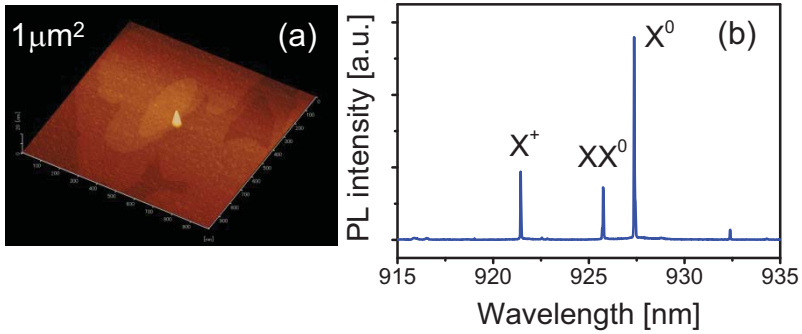

Fig.2 (a) AFM image of single InAs QD (b) micro PL spectra of single InAs QD at low temperature .

InAs quantum dot (QD) is attractive for gain medium of laser diode, and sources of single photon and/or entangled photon pair in quantum information technology.

InAs QDs are grown on GaAs substrates by molecular beam epitaxy (MBE).

①Comparing with usual modulation doping to InAs QDs in active layer, improvements of both J_{th} and its temperature insensitivity were achieved by δ-doping. The X-sectional TEM image of δ-doped InAs QDs laser diode and its 1.3 μm lasing spectra at RT are shown in Fig.1.

②Low density was achieved by very low growth rate of InAs. Growth temperature of initial GaAs cap on InAs QDs lead suppression of background emission as noises. Additionally, control of charge state in a QD was achieved by δ-doping. These QDs contributed generation of single photon and/or entangled photon pair, and lasing from single QD. AFM image of low density InAs QDs and micro PL spectra from excitonic states in a QD are shown in Fig.2.

Keywords : Quantum dot (QD), Molecular beam epitaxy (MBE)

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